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# Electrical Contracting

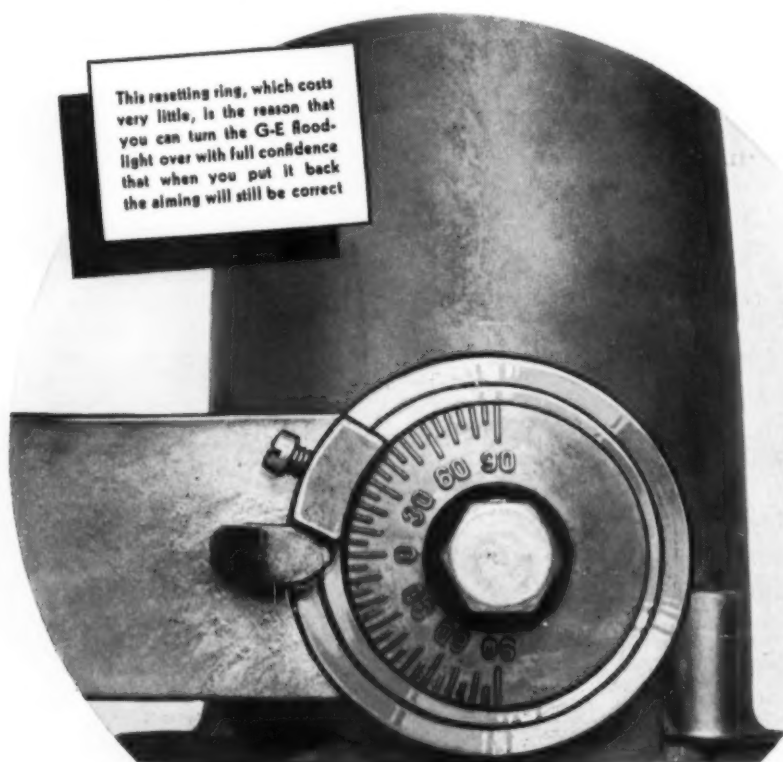


MARCH • 1939

# HAVE YOU EVER SEEN A FLOODLIGHT SO EASY TO SERVICE

**T**HE ease and convenience with which G-E Novalux Floodlights can be relamped and cleaned are important factors in any type of floodlighting job. (1) The G-E floodlight can be raised or lowered to any position convenient for servicing. (2) The sliding door can be removed simply by releasing a single clamp. (3) If the special repositioning stop is used, the projector can be returned to correct position merely by letting it fall back against the stop. (4) Clamping bolts are conveniently located and can be easily reached and adjusted. Servicing is done quickly and at small expense.

These helpful features—that distinguish G-E floodlights—have proved their worth on many installations. Together with the qualities of sturdy construction, trim appearance, and high efficiency, these features have earned nation-wide acceptance for G-E Novalux floodlights. Try G-E floodlights on your next job. For further information, send the coupon to General Electric, Schenectady, N. Y.



This resetting ring, which costs very little, is the reason that you can turn the G-E floodlight over with full confidence that when you put it back the aiming will still be correct

Service man easily reaches G-E floodlight. He loosens clamping bolt on right side and prepares to raise unit to convenient position



Floodlight is easily raised, and service man now loosens single clamp on sliding door. He does not lean over platform edge but works in safety



Door is off, and service man replaces lamp. Then he slips door back against repositioning stop. Correct adjustment is maintained



General Electric, Dept. 6A-201  
Schenectady, N. Y.

Please send me your Floodlighting Catalog GEA-1865C.

Name .....

Street .....

City .....

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500-317

GENERAL  ELECTRIC



*There's a profit in every foot*

ORANGEBURG

# NOCRETE CONDUIT *the new Dual Economy*

*new!*

● NOCRETE conduit assures you of savings in material costs—Orangeburg NOCRETE conduit is about half the cost of metal pipe and less than non-metallic conduits of any comparable quality. Ask our representative for prices. Extra couplings and all types of fittings, elbows, bends, etc., are available.

● Savings in installation costs—it "handles easy"; light in weight, in handy 5 or 8 foot lengths (in various sizes), this super-sturdy duct will surprise you by its adaptability. It assembles and installs easier, faster and at a lower cost than any conduit you have ever used. It is readily cut and fitted with ordinary wood-working tools.

For use underground  
without concrete encasement

Cutting ordinary "pipe" on an outdoor job can be a profit-eater, as any contractor knows. A man takes plenty of time to cut through 3" conduit; then there's the cost of hacksaw blades; and all too often on an outdoor job conditions are far from ideal for the most economical possible cutting operations.

But when you use NOCRETE conduit, cutting problems are simple. You even cut it with a woodsaw—yet it's remarkably sturdy and resistant to damage under normal job conditions. You'll make greater profits on even the smallest job if you use Orangeburg NOCRETE Conduit underground.

Write today for complete information.  
Ask for Bulletin ECDM.

## THE FIBRE CONDUIT COMPANY

Sales Office: 292 Madison Ave., New York  
Factory: Orangeburg, N. Y.

Sales Agent—Distributors:  
General Electric Supply Corp.  
The Graybar Electric Co.



# ORANGEBURG



**"I C"** = Interrupting capacity

## BE SURE of YOUR "I C"

THE severity of a short circuit depends largely on the capacity of the transformers that feed the circuits, and it can *not* be determined by the normal load on the circuit. As plant loads have grown, transformer capacities have been materially increased. Therefore, short circuits present an ever-increasing hazard. They gravely endanger personnel and property wherever the power supply has outgrown the interrupting capacity ("I C") of the protective devices.

Are you sure of your "I C"? With G-E air circuit breakers of *known* interrupting capacity, you *can* be sure.

If you have any question about how to determine the interrupting capacity needed, in order to know the size of circuit breaker to use, get in touch with the nearest G-E office.

# G E N E R A L

# If you check your **"IC"**

Interrupting capacity

## You'll Want to Install Air Circuit Breakers at Once on Main and Branch Feeders

**T**HEY not only have plenty of "IC"—they provide overcurrent protection, with adjustable time delay, and you can restore service at once—by simply turning the handle.

For main feeders—the metal-enclosed, shipped-assembled switchboard with draw-out-type breakers.

For branch feeders—the individual safety-enclosed breaker with plenty of "IC." Designs available for interrupting currents up to 80,000 amp.



# E L E C T R I C

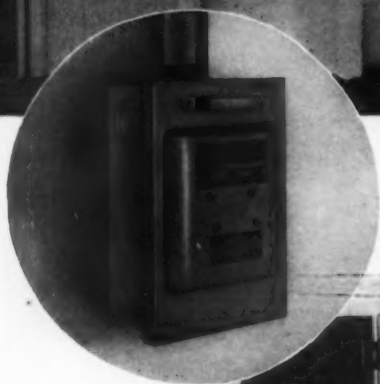
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# WADSWORTH *equipment chosen* for one of the first **LIFE HOUSES**



The Wills-Blackbourn "Traditional" Designed by Royal Barry Wills. Income Group, \$5,000-\$6,000.



Adequate wiring is the keynote throughout this Wills-Blackbourn "Life House" shown above.

Electrical Installation By  
Ross Electric Co.,  
Pittsburgh, Pa.



**L**IFE'S EDITORS call it the Wills-Blackbourn "Traditional" . . . Located in beautiful Baldwin Manor, suburb of Pittsburgh, Pa. Wills-Blackbourn "Traditional" is one of 8 model homes sponsored by "Life", and designed by 8 Nationally known Architects.

Throughout the United States many of "LIFE HOUSES" are NOW under construction. These homes provide every modern convenience without sacrificing any of those "Homey" features so essential to Family Comfort . . . and friendly hospitality.

The selection of Wadsworth equipment for the Wills-Blackbourn House shown above is a genuine tribute to the dependability . . . and satisfactory performance of WADSWORTH'S products.

Photographs Courtesy Life Magazine



The Koch-Ramsey "Traditional".  
Designed By Richard Koch.  
Income Group . . . \$2,000-\$3,000.



The Embury-Smith "Traditional".  
Designed By Aymar Embury.  
Income Group . . . \$10,000-\$12,000.

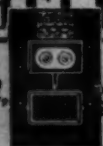


The Kelley-Calvert "Traditional".  
Designed By H. Roy Kelley.  
Income Group . . . \$3,000-\$4,000.

Whether it be cottage or castle, there are suitable Wadsworth devices to meet the requirement. Electrical Contractors know they can depend on Wadsworth products. They do not hesitate to recommend them for use where the conditions are most exacting.

**BUY WISELY . . . BUY WADSWORTH, "THE PROFIT LINE FOR '39"**

*The* **WADSWORTH ELECTRIC MFG CO. INC.**  
*Corington, Kentucky.*



# Electrical Contracting

With which is consolidated The  
Electrict and Electrical Record  
Established 1901

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A SERVICE PAPER for electrical contractors, engineers, motor shops, industrial electricians and inspectors, covering engineering, installation, repairing, maintenance and management, in the field of electrical construction—industrial, commercial, and residential.

NEWS for the  
power industry from  
Anaconda Engineers

# Many are tested, but few are chosen!

*Out of the many insulations  
tested each year only a few are  
accepted as worthy!*

DEVELOPMENTS move so swiftly in the cable industry that it is impossible to wait for years in service to determine whether a new insulation or cable construction is any improvement over present types. Actual service records are the final criterion of cable operation. If there were no other way to foresee cable performance, progress would be exceedingly slow. To pre-determine the serviceability of new insulations or constructions, aging tests have been devised to aid and accelerate development.

Hundreds of new compounds are manufactured and subjected every year to these severe accelerated tests. Only a few emerge as worthy.

Such painstaking search is indicative of the endeavor of Anaconda engineers to build long life and outstanding performance into Anaconda cables. The benefits of this research are being passed on to the industry in the form of more enduring constructions.

#### *Put your problem up to Anaconda*

You are invited, without obligation, to discuss your cable problems with Anaconda engineers. For your day-to-day requirements also, you will find that the name "Anaconda" on cables means the utmost in service.



Accelerated aging tests are one of many by which the life of Anaconda cables are predicted. Here you see a technician placing samples in the Geer Oven.



Specially designed apparatus for collecting gases evolved from rubber insulations, used in the laboratory to study insulation characteristics as an aid to improvement.

39284



USE MODERN  
IMPROVED

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MARCH, 1939

## Try Resentment

A SOUTHERN CONTRACTOR told me this story: He found that one of his industrial customers had just been quoted the contractor's big quantity price on 500 ft. of No. 14 wire. He sent for the wholesaler who had done the bad quoting and ordered 50,000 ft. of No. 14—to be delivered 500 feet a day.

THE WHOLESALER'S SALESMAN HAD A FIT. But this contractor feller said, "Take it or leave it!" So the chain branch manager himself dropped in and said, "How come?" And he was told.

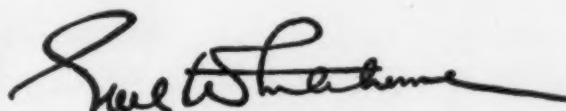
"WHY, YOU'RE NOT GOING TO BE AS MEAN AS THAT!" exclaimed the wholesaler. But the answer to that was—"Is it worse to be mean to a wholesaler than to a contractor? Take it or leave it!" He took it and for 100 days the truck called round and left one bundle—and lost money every trip.

LORD LOVE US! It's about time this kind of monkey business with discounts was stopped. For if there is a price schedule it should be on the level. And wholesalers and manufacturers who are not honest with their customers should be punished. How? Well, the best way is red hot resentment by the man who is injured.

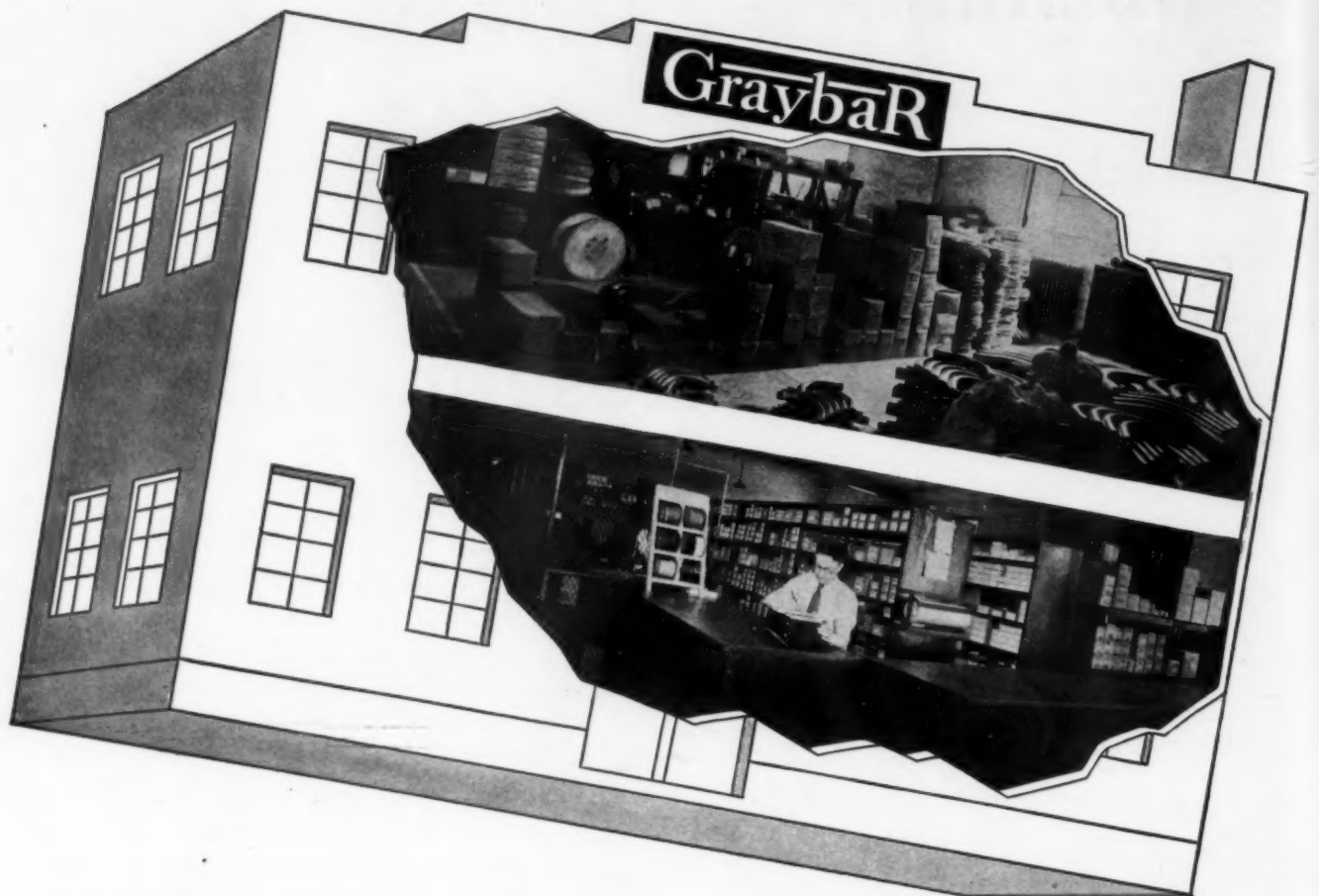
MY CONTRACTOR FRIEND FOUGHT BACK. And so can any other contractor. For plain talk and quick action still enforces fair play between men, because the guy who is wrong gives in when he is scared. Just call him fast and hard. And if he won't be good, turn loose your indignation publicly against him.

IN SUCH A CASE, I'd like to see a frank statement of the facts go out to every other contractor in town, to every wholesaler and manufacturer! No libel! No boycott! Just a plain statement of indignation by an individual, in which you tell the cockeyed world that you refuse to be a sucker and hereby sever all relations—and the reason.

WHAT THEN? Well, a man's good name is all he has. And nobody can prosper in any town if he does his customers dirt—and it is known. So let's announce the fact when it occurs. The trouble with the average contractor, when he is wronged, is that he doesn't get mad enough to make it hurt.



# YOUR WAREHOUSE IS READY



**... and it won't cost you a cent!**

THE WAREHOUSE we maintain for your convenience is different from ordinary warehouses...

The stocks it contains have been carefully built up for years to meet electrical contractors' needs...*whatever those needs may be.*

Whether you specialize in industrial, commercial, or home installation—you'll find your Graybar warehouse amply stocked with the items you need.

In some cases where contractors have had special needs, we have been able to build special stocks to meet these needs—and will do so again where justified.

Furthermore, you'll find your Graybar warehouse manned by experienced men trained to give you quick

and intelligent service, either at our handy pick-up counter or by speedy truck delivery.

Finally, you get this assurance—every item from Graybar can be depended upon. Graybar's guarantee backs you up on every job where you use our materials.

Get more *plus value* for every dollar you spend...by making Graybar your supplies' headquarters.



## A FEW KEY PRODUCTS available through GRAYBAR

- APPLIANCES—ALL TYPES
- BOXES—ALL TYPES
- CONDUIT—HEAVYWALL, THINWALL, FIBRE, ETC.
- CONDULETS
- FITTINGS—ALL TYPES
- FLEXIBLE CORDS—ALL TYPES
- FUSES
- INSTRUMENTS
- INSULATING MATERIALS
- LAMPS AND LIGHTING
- METAL MOULDING
- MOTORS AND CONTROL
- PANELS AND CABINETS
- SIGNALING EQUIPMENT
- TAPE—RUBBER AND FRICTION
- TOOLS
- TRANSFORMERS
- UNIT HEATERS
- VENTILATING EQUIPMENT
- WIRES AND CABLES—ALL TYPES
- WIRING DEVICES

OFFICES IN 83 PRINCIPAL CITIES • EXECUTIVE OFFICES, GRAYBAR BUILDING, NEW YORK, N. Y.



APPLICANT'S IDENTITY becomes a number at the registration desk. Miss Hackett checks application file, assigns number, files identification key. Eugene Eastman, (center) engineer, Michigan Electrical Administrative Board is official observer. Carl Mason, District State Electrical Inspector is in charge of the Mt. Pleasant examination.



PRACTICAL QUALIFICATION test eliminates most of the applicants. Those not making the required 75 in 2½ hours are not permitted to take the written examination for a license.

# Michigan PROTECTS CONTRACTORS

By W. T. STUART

It was a sunny Saturday morning in Mt. Pleasant, Michigan, about 80 miles north of Lansing, the headquarters of one of Michigan's electrical examining divisions. An examination board was conducting practical qualification tests there, as a preliminary to the required written examination. The cab driver tipped me off when I told him to head for the gymnasium building at State Teachers' College.

"Going to the electrician examination? Well, let me tell you they are tough. My buddy went over early and walked out. They have a lot of trick stuff you have to wire up, junk he never saw before in his life. He was plenty sore."

"Does he work at the trade regularly?" I asked.

"No, but he does some wiring on the

side and he has to know his stuff."

The cabbie was right. First, the examination procedure was rigid. Second, the test demanded ample experience and an up-to-date working knowledge of the Code. The examiners were in dead earnest, they expected a man applying for an electrical contractor's license to have a good general knowledge of wiring and the Code. They expected

Licensing is a subject of vital importance to electrical contractors. Several states have bills pending before legislatures. Contractors in other states are helping to prepare similar bills. Michigan has had a license law since late in 1935. They have recently adopted a new examination technique that protects contractors. *Electrical Contracting* sent Bill Stuart up to Mount Pleasant with camera and book to get the low-down.

journeyman applicants to be able to hook up common circuits, recognize Code violations and have a working knowledge of the Code.

Carl D. Mason, district inspector of Mount Pleasant was in general charge, assisted by inspectors L. E. Felt of Baldwin and A. P. Schramke of Saginaw. From the Lansing office of the Michigan Electrical Administrative





**FIRST STEP,** Dispatcher, seated at board, routes applicants to vacant practical test boards recording time and board number opposite applicant's number on control sheet. Applicant must take board assigned and report back with a monitor at finish.

Board, Eugene Eastman, field engineer, acted as adviser and observer. At a desk in the second floor of the building, Miss Hackett, secretary to Mr. Mason, received the applicants. Original application forms had been filed up to 30 days before the examination.

As each applicant reported, an "Identification key" gave each man a code number which was typed on a report card. The applicant carried this card with him through the examination, and had no other identification. Entering the practical examination room, the applicants reported to the dispatcher seated before a large chart with 38 board numbers cross indexed with card numbers. The applicant's starting time was recorded at his card number and a test assigned.

#### What They Do

Applicant No. 49, J.A.S. of Cadillac, is typical of those who passed the test. He wired up a service entrance board, a fixture board, two wiring boards and a power board. He checked a violation board and a board requiring identification of conductors. He dropped a couple of points on violations and conductor identification, otherwise his score was perfect, 12½ points to a board. Out of a pair of eight boards, he needed only six to make the minimum 75 points. Individual scores were entered upon his report and initialed by a monitor.

This practical qualifications test passed, he was sent to an examination room on the third floor for the written test. Four examinations covering code rules and wiring methods were given



**TEST MATERIALS** are selected from this stock after applicant checks his job. Wire and cable are contributed by wholesalers and manufacturers. Test uses 1,500 feet of wire, 500 feet of armored cable and the same amount of non-metallic sheath cable.



**AT WORK,** the applicant, M. R. Gardner of Boyne City, wires up a cutout box and magnetic controller with external push button station. Monitor H. B. Scherping, electrical contractor of Houghton Lake, stands by. Perfect job scores 12½ points.



**ROUNDED EXPERIENCE** is easily checked when the applicant tackles a board laid out with explosion proof and vapor proof fittings and wiring devices. Handy men do not do so well with this test.

during a period of four hours. The completed papers, identified only by number, were sent to the Board of Examiners to be checked with master sheets and scored. On four papers he scored 72.9 per cent, 71.1 per cent, 82.5 per cent and 89 per cent, respectively, averaging well above the 75 per cent required for passing.

Is this practical qualifications test a fair appraisal of the applicant's ability to take the written examination? This question comes up. But let's take the case of W. B. who failed to qualify because he averaged only 55 points on seven boards. Although this would



**WHAT'S WRONG** with this wiring? There are 57 electrical defects on this board. Applicant Bert Smith must identify as many as he can in 20 minutes for Monitor George Bradford, Baldwin contractor.

normally bar him from the written examination, he insisted upon taking them and the examiners permitted him to go on. He scored an average of 45.7 per cent on four papers, a rating even lower than his practical qualifications test score. Then there is C. B. who made a 69 on the practical test, only six points under qualification. He was permitted to take the written examination and on three papers he averaged only 41.1 per cent.

Again is the examination too difficult, as some unfortunates complain? Are competent men being barred from the electrical contracting business by

standards set too high? This is a fair question and one which is difficult to answer objectively. A fair check would be—how good a score would a man of known experience and qualification make?

Using myself as a guinea pig, I took a portion of the examination. On three practical qualification boards chosen at random, I was able to make the maximum score of 37½ points without difficulty. On a written examination, taking approximately one-third of the allotted time, I scored 94 per cent. It is my opinion, that a competent electrician with a fair amount of job experience and a good working knowledge of the code could easily meet the minimum 75 per cent requirement. This is borne out by the experience of several of the examiners. A contractor or contractor's supervisor with a broad experience would find the test quite simple and should make a high average score.

#### How Many Passed

From a list of 187 applications in the Mount Pleasant division, 134 applicants registered for examination in this batch. For various reasons 33 of these men were not required to take practical qualification tests and were entered in the written examination directly. Fifteen failed. Eighteen passed. Many of these had previously passed one or more papers and the practical test and were returning to complete the written examination. Of the 101, who were required to take the practical test, 49 failed or gave up, 38 qualified and later failed the written test. Only 14 passed.

WRITTEN EXAMINATIONS follow. Three to four hours are spent answering questions regarding the Code and wiring methods. Applicants must take three papers for journeyman's license, four for contractor's or supervisor's license; cannot take same paper on re-examination.

The practical qualification test boards were prepared by the district inspectors with the help of local contractors. In the Mount Pleasant division 39 boards are used consisting of actual wiring devices, fittings, fixtures, etc., laid out ready for wiring. The materials for these boards were furnished free of charge by manufacturers and electrical wholesalers in the district. As nearly as possible, the problems are standard wiring hook-ups that the electrical contractor or journeyman normally encounters on ordinary jobs. There are no trick circuits or unusual materials used. The only tools required for the examination are cutting pliers, a good screw driver and a knife. Basic directions to the applicants are printed on a sheet fastened to the upper right-hand corner of each board.

#### Is It Honest?

Because examinations are held under the jurisdiction of a state body, the question inevitably arises—Can an applicant "fix" an examination by proper political pressure? The fact is that the Governor himself could give an applicant no more than his blessing. The practical qualification tests are monitored by a corps of district examining board members consisting of contractors, utility men, city inspectors, state inspectors; and in the eight tests permitted, it is unlikely that the applicant will have the same monitor on any two tests. Further, after leaving the registration desk he is identified only by number. The examiners who rate the written papers see neither the identification file nor the applicants during the examination period. The examiners receive papers for marking at random, so there is no way to route an individual paper through any particular examiner.

Under the present schedule, examinations, in the State of Michigan, are held



OVERSEERS, District inspectors L. E. Felt of Baldwin, Carl D. Mason of Mt. Pleasant and A. P. Schramke of Saginaw receive applicants, shoot trouble and keep the wheels running smoothly.

simultaneously in each of seven inspection divisions, every three months. Those failing an examination are permitted to return either in three or six months, depending on their grades. But a permanent file record prevents a returning applicant from getting the same examination on which he previously worked.

#### Still Evolving

The Michigan examination procedure is still new and will undergo many detailed changes, says A. T. Babbitt, chief inspector of the Michigan Electrical Administrative Board. But the success of the practical qualification tests and the reaction of both the applicants and examiners to this procedure will make it a permanent part of the licensing examination.

EXAMINERS RATE papers on into the night. Applicant's number is only identification. (Left to right). Inspectors Edward Link, Lansing; M. J. Hawkins, Alma; John Denner, Saginaw; William Trott, Alma; C. A. Crosier, Battle Creek; W. G. Keith, Lansing; (standing) Carl D. Mason, Mt. Pleasant.



# Maintenance for Mass Production

The wheels must be kept moving on thousands of electrically operated machines, in the modern motor car factory. That is Ben Clark's job at the Plymouth plant in Detroit. He tells us how some of the maintenance problems are handled.

**By Ben Clark**

*Chief Electrician Plymouth Division,  
Chrysler Corporation, Detroit, Mich.*

**T**HE modern motor car factory is perhaps the most highly mechanized industry in existence today. From the handling of heavy castings to fine machine work of the highest precision, hundreds of independent processes are handled by automatic electrically driven machinery. These independent processes in turn are so coordinated, controlled and inter-locked that they run smoothly together to give a steady flow of finished automobiles off the assembly line.

So from the standpoint of electrical maintenance, the automobile plant must be considered as a single organism rather than a collection of independent machines. It is an organism in which the electrical feeder systems are the arteries and the control circuits are the nerves. The electrical maintenance man must think in terms of the operation of the plant as a whole, and the department is organized as carefully and as efficiently as any part of the long and complicated production line.

In the Plymouth division of the Chrysler Corporation, we have an electrical maintenance staff of 54 men, divided into three groups, supervisory, maintenance and construction. The electrical maintenance department is one unit of the general plant maintenance staff which includes janitors, carpenters, construction men, millwrights, tin-smiths, and plumbers, all working under the immediate supervision of plant engineer C. C. Williams.

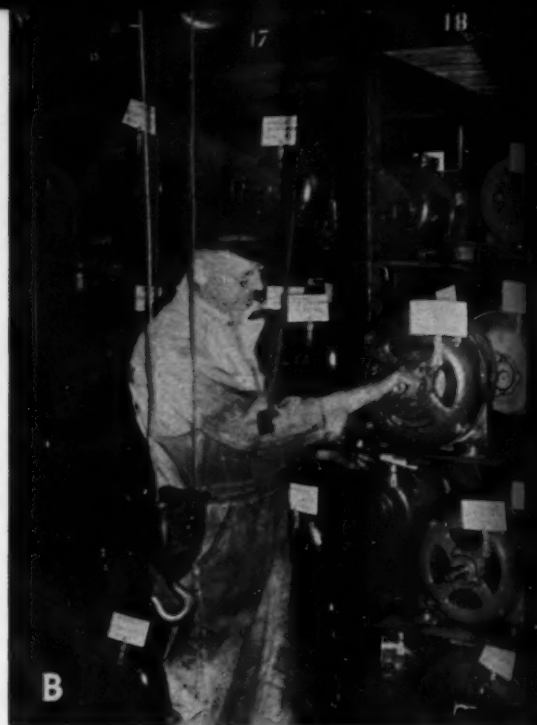
## **Keep Wheels Turning**

Maintenance work is controlled from a central office where incoming calls are received, and men dispatched to the job. There are also four stations or cribs

located at strategic points around the factory, each manned by a crew of mechanics.

Our first job, of course, is to keep the wheels turning. Every minute of lost time caused by shut-downs is charged by the production department to our office. That means we must look ahead of trouble and prevent shut downs by eliminating the causes before they occur. In spite of the most careful precautions, however, emergencies do occur. But over a period of years shut downs have never exceeded one-quarter of one per cent.

In a total of 13,400 hp. motors we have approximately 100 burnouts in a year. Bearing trouble is rare, as all







**A.** CHIEF ELECTRICIAN Ben Clark keeps prepared for overnight changes and redistribution of load in the Plymouth plant.



**C.** MOTOR HISTORY file gives characteristics, age, machine number, location in plant, and a record of all repairs.

**B.** REPLACEMENT MOTORS, on shelves like a filing cabinet reach the job before millwrights have removed the "cripple".

**D.** SPARE HIGH CYCLE tools are racked in readiness for an SOS from the busy assembly line workers.

of our motors are equipped with ball bearings. When machines become jammed or temporarily overloaded, it is often necessary to plug the protective relays to keep the machine in operation, until it can be shut down for repairs. It is often cheaper to risk a re-wind job than to tie up a million dollars worth of production machinery even for the short time necessary to change motors.

In a rack near the maintenance office is a stock of 300 spare motors from which we can fill any ordinary emergency demand. Motor changes are a matter of minutes. On the assembly line, for instance, motors driving the main conveyor can be changed in twelve to fifteen minutes.

#### Handling Trouble Calls

Ordinary trouble shooting, lamp burn-outs, contact failures, blown fuses, broken cords, are handled by zones from the maintenance cribs. The department requiring service, calls the maintenance office. A work order form is made out and the time stamped. The order is then telephoned to the nearest crib and the mechanic dispatched with the necessary tools and parts to take care of the trouble. As soon as the trouble is corrected, the mechanic reports back to the main office and the time of completion is again stamped on the work order. In the event that any job takes more than fifteen minutes, the mechanic must report to the office and call a member of

the supervisory staff for approval.

To expedite the dispatching of mechanics, the plant is divided into 32x40 ft. bays designated by letters east to west and numbers north to south. In addition, each machine is equipped with a numbered brass tag. Requests for

#### EIGHT PLYMOUTH MAINTENANCE MUSTS

1. The wheels must be kept moving at all reasonable cost.
2. Winding burnouts are risked during temporary overloads rather than tie up production flow.
3. Power costs and power factors must be kept under constant supervision.
4. All motors receive thorough inspection and are repacked with grease once each year.
5. Overheated or otherwise faulty motors are spotted and checked for overload, bearing fault or insulation failure.
6. Hoist and crane motors are checked periodically for brush and commutator wear.
7. Starters and controllers are regularly checked for contact wear and repaired before trouble can start.
8. A separate 3-man crew takes care of 1000 high-cycle tools, making all repairs except re-winding.

service when entered on the work order indicate the bay and the machine number.

In manufacturing motor cars, we must be constantly prepared to make radical changes in the arrangement of machinery, to install new machinery or move entire departments. Our feeder system is designed to be quickly adapted to any rearrangement of loads that may be required. Power supply enters the primary vault over six 3-phase, 4,600 volt service cables and is distributed to seven transformer banks located on the roof of the building. Secondary power is distributed over three main feeders, and a main auxiliary feeder running the full length of the building.

#### Prepared for Changes

The feeder system is sectionalized by disconnect switches which limit sections of the plant to individual transformer banks. The main auxiliary feeders are normally connected to a separate bank of transformers used as an emergency standby. Through the operation of the sectionalizing disconnects, transformer banks may be paralleled, individual banks cut out of service or load redistributed without shutting down the plant. With this feeder system the moving and reconnection of machines is a simple matter of extending a feeder from the disconnect switch up to the nearest open feeder and tapping in.

Keeping a close watch on power costs is also part of the work of the maintenance department. By the use of synchronous motors on all large drives and heavy loads, capacitors at transformer banks, and the proper application of motors to load, we are able to maintain a power factor of 93 per cent. Not many years ago it was common industrial practice to power machines with motors liberally in excess of the load. Now by load test with recording instruments, we are able to select the proper size of motor for machine drives with great accuracy. The result is good power factor conditions, with a reasonable allowance for unusual over-load conditions.

With the ever increasing number of new electrical devices and the constant demand for new applications of electricity in the automobile plant it is our job, as maintenance electricians, to continually revise our methods and refine our skill. For the only thing that counts is that our electrical system and the thousands of electrical mechanisms shall be as trouble free as the cars that drive off the end of our assembly line.

# Bossing the JOB with a MIKE

Sound Equipment Takes its Place as a Time Saver on Large Construction Work.



## TALKING BACK

*Out on the job, field engineers grab important telephone calls quickly from nearby phones, when they are paged over the office mike. Routine orders come through tree-mouthed speakers.*



## JOB CONTROL

*With a project covering 26 acres and some 50 scattered structures, these builders let speakers get their men. Five sets of speaker-phone stations cover the project. No steps are wasted.*

**S**OUND amplifiers speed construction routine on a 26-acre building development in Plainfield, N. J. Placed at various busy spots, with telephones nearby, quick supervision is made possible by microphone from the builder's main office. Field engineers and foremen may be paged or crews shifted. Executives can be reached quickly among the various structures. And the time of costly incoming long-distance calls is kept to a minimum by

speeding up connections for architects and others out on the scattered units comprising this job.

The system is operated in the job office by a clerk who handles all incoming telephone calls. Persons are paged by microphone when necessary. Orders are likewise announced to craft or crew foremen over the mike, instead of sending a messenger a distance of 1000 ft. or more to various buildings to find the proper person. Any one can

call back to the office by telephone, if the message conveyed by speaker needs more explanation.

This system was installed by the Friedman Electric Company of Newark when this \$2,000,000 apartment building project first got under way. As additional structures began to take form, speakers and telephones were added until there are now five sets of speakers and outdoor telephones, all under central control in the builder's office.





### BUILDERS BROADCAST

*This executive personally gives instructions to his engineers and foremen by "mike" without donning galoshes or running the gauntlet of cement seepage.*



### FROM THE START

*In early stages of construction, speakers and phones were located to serve several jobs and keep pace with changing needs for supervision.*

### TREE STATIONS

*for telephones have speakers above, all controlled from the central job office.*



### ON THE WAY

*Paged by speaker, this foreman gets information back to the boss without a trip to headquarters while helpers wait.*





# Selling Light to the Machine Shop

Equipment, layouts, and intensities to use

**G**ENERAL lighting is the major source of illumination in a machine shop. Supplementary lighting to provide high intensity for local applications is built upon this background of comparatively high general illumination. Intensities in the order of 25 footcandles will prove satisfactory and are economically feasible for the average progressive machine shop. And, of course, layout, fixture spacing, unit sizes, and the types of lighting units used must be adapted to the building and the machine layout.

In the accompanying layout the fixtures are spaced on 8 by 10 ft. centers and mounted 12 ft. above the floor. The system shown is a combination of mercury vapor and incandescent lighting. Therefore, by alternating mercury and incandescent fixtures in each row, the comparatively close spacing effectively mixes the light from the two types of lamps throughout the shop. In the event of momentary failure to the tubes the incandescent units will stand by. They will provide in excess of 10 footcandles, evenly distributed, during the time necessary for the mercury lamps to return to full brilliance.

## Layout and Inspection Bench

The lighting of layout and tool and die work benches will depend largely upon the character of the production in

the individual shop. In this plan, large area, low brightness reflectors with daylight cover glasses are used, suspended 36 in. over the working surface. In working on metals or other highly polished materials, the brightness in foot lamberts is often more important than intensity of illumination. For instance, work involving chromium plated sheets would require brightness of 250 foot lamberts or less.

With this type of fixture the surface brightness can be altered by changing the size of the lamp. The foot-candles of lighting intensity should be maintained at as high a value as can be conveniently maintained, without excessive brightness on the surface of the fixture. This is partially accomplished by the fixture design and may be aided by locating the unit as close to the working surface as is convenient.

Unpolished metal parts, which must be examined for pits and scratches, may require directional light to show up high lights and shadows. For this type of work, industrial spot lights set at an angle to the work, may be required.

## Lathe and Machine Tools

Drill heads, boring machines, milling machines and lathes require accurate seeing. It must be focussed in the limited area where tool settings are adjusted and the tool contacts the work.

## MACHINE SHOPS NEED LIGHT

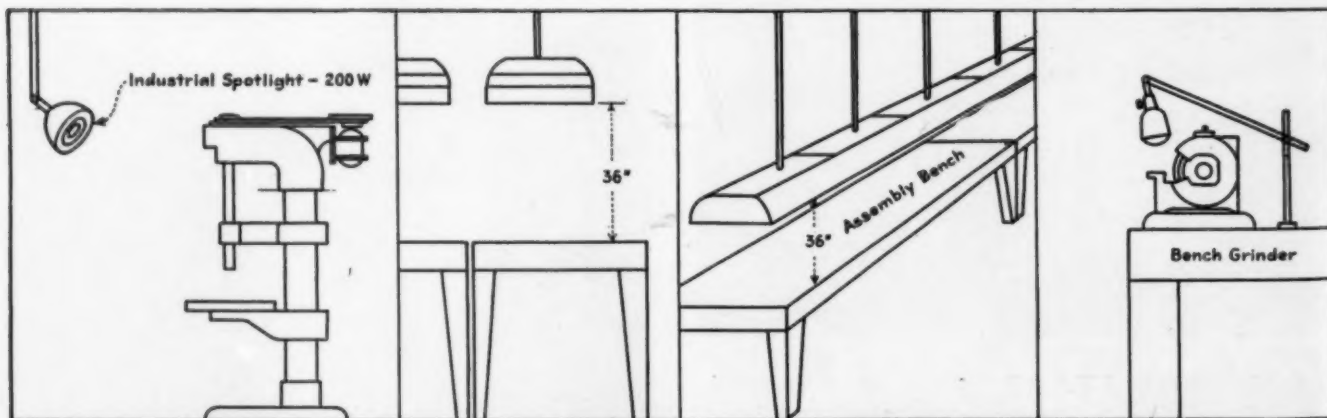
Precision machine work is the backbone of American industry. It involves difficult, exacting seeing tasks which demand the highest standards in lighting equipment and application. Machine shops are found in every city. They all have the same lighting problems. So do metal working plants of other kinds and machinery departments in a diversity of factories. Many of them are located in your community. Most of them are inadequately lighted, according to modern standards. Some are using obsolete lighting equipment. Some have good equipment and are using it in the wrong way. All these cases present opportunities for the contractor, and any contractor who will specialize a bit in machine shop lighting can build up a profitable going business in this field.

These operations usually require prolonged concentration on the visual task and may need in excess of 100 foot candles more illumination than is provided by the general lighting system. For production machines under steady operation, supplementary lighting from a high intensity industrial spot light is recommended with louvers to control spill light. These spot lights are mounted at an angle to the task and set behind and above the operator.

The mounting of the spotlight should be such that no direct reflection is cast into the eyes of the operator from machine parts. Also, the light beam should be so directed that the operator will not cast a shadow on the work when at his normal station. To avoid excessive contrast with the surroundings, such high level supplementary lighting should be used only in the presence of an adequate general lighting system.

Small bench lathes, grinders and other

[Continued on page 53]



MACHINE TOOL supplementary lighting requires high intensity at working areas backed by adequate general lighting.

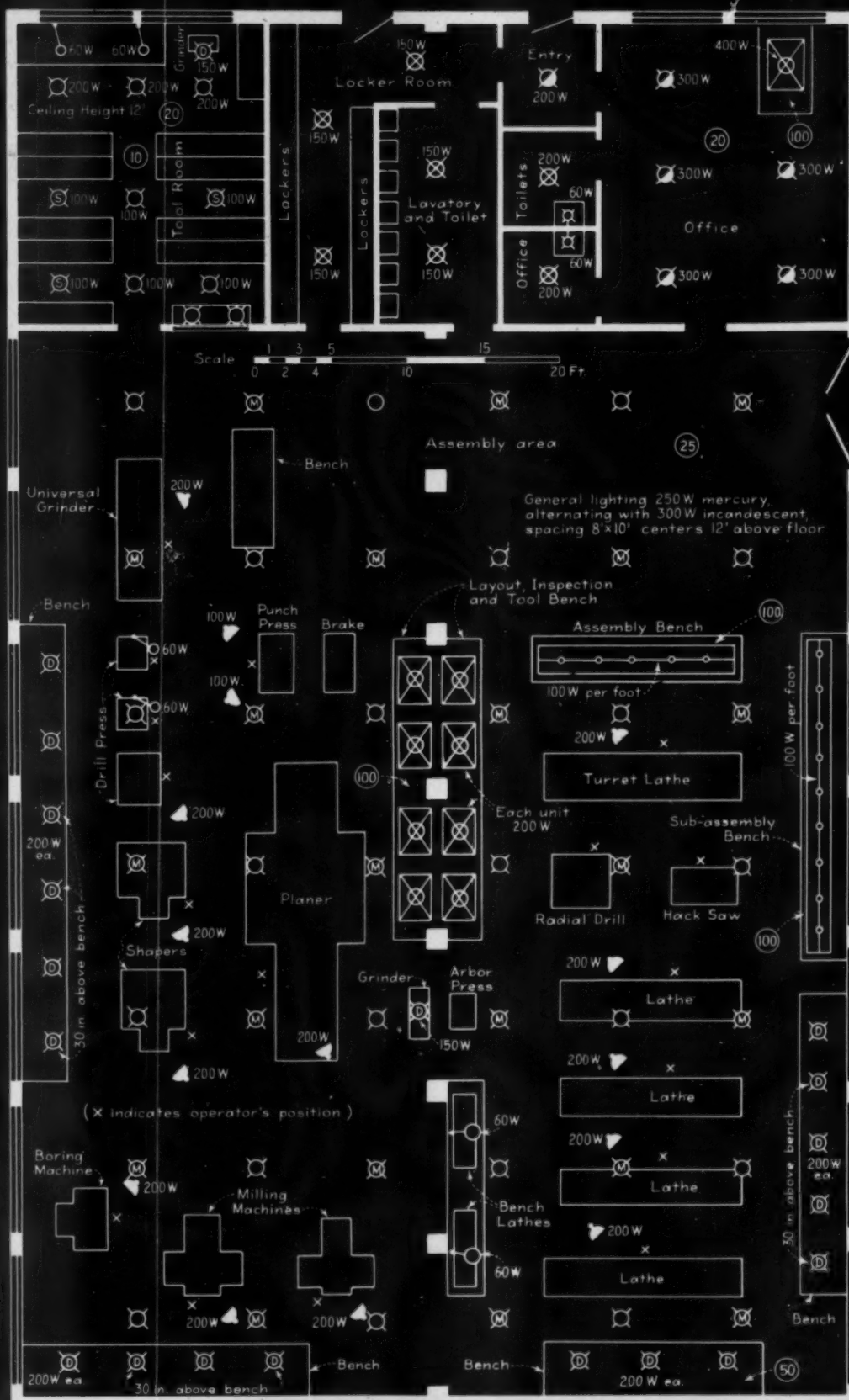
LAYOUT BENCH lighting by large area, low brightness reflectors with daylight cover glass kills reflected glare.

ASSEMBLY LINE canopy reflectors economically provide high intensities over the production line with even distribution.

LOCAL LIGHTING by small projectors mounted on the machine provide essential supplementary illumination where needed.

# Good Lighting for the Machine Shop

Recommended location of outlets, type of lighting equipment and intensities of illumination required.



- - RLM dome
- ⊗ - Deep bowl reflector on drop cord
- ⊗ - Stock bin reflectors
- ⊗ - Ceiling fitter and opal globe
- ⊗ - Wall bracket
- ⊗ - Adjustable arm with reflector
- ⊗ - Semi-indirect units
- ⊗ - Industrial spotlight
- ⊗ - Low brightness reflectors
- ⊗ - Assembly line canopy units
- ⊗ - Minimum foot candles

# SERVICING NEW MOTORS

Motor shops can do much to save money and customer goodwill for motor manufacturers. This shop in Newark cures new-motor headaches for several makers.

**M**OTOR users are often faced with seemingly unnecessary complications, when motors appear to give trouble during their one-year guarantee period. At the same time, the motor manufacturers frequently assume unreasonable service costs, just to keep peace with a customer. This is so because 90 per cent or more of the service calls on guarantee-period motors can be attributed to other than motor troubles.

That is the experience of Ira Nelson of the I. R. Nelson Company, 31-year pioneers among the larger motor service shops in Newark, N. J. So this company has worked out a service set-up to help motor manufacturers smooth out unpleasant and costly customer complaints. Mr. Nelson sees a way to progress in the experiences gained from doing such work for five motor manufacturers and four makers of electric tools. With motor types and applications becoming more complicated, he sees the responsible motor service shop increasingly indispensable to the continually broadening list of competing manufacturers in this field.

The chief factors involved can be summed up in what customers expect—

1. Prompt attention when trouble occurs.
2. Definite reports and speedy restoration of service.
3. Impartial analysis and placing of responsibility for cause of trouble.
4. Fulfilment of guarantee.

The manufacturer's ability to fulfill guarantee obligations depends on being

well set up to obtain prompt and loyal cooperation from shops in any given locality. In a word, the first need is to make it profitable for motor shops to be honest with both the customer and manufacturer. And to work most effectively, Mr. Nelson believes the service organization's real value is not to be measured on a basis of motor sales. The shop to be most helpful—

1. Renders a prompt and impartial emergency inspection service to customers who have trouble with new motors.
2. Saves the motor manufacturer the expense of making miscellaneous calls at remote places.
3. Restores service promptly and reports trouble accurately for adjustment.
4. Protects the manufacturer's product against criticism from competitors.

These broad principles can be applied to the service rendered by shops, in any locality, with any number of fair-minded manufacturers who use their services. Customers make complaints and demand service whether the motor involved cost \$8 or \$800. The cost to run down the trouble is of no concern to the user, if a heating plant is idle, or if a compressor does not operate because of motor trouble. The firm supplying the fan, pump or compressor is held responsible and final payments are often held up. Good will is at stake, so the motor trouble must be corrected regard-

**HELP NEEDED.** *This new gear-head explosion-proof motor was damaged in shipment. Local repairs made it possible for the customer to avoid delay.*

**IRA NELSON,** *whose father founded the I. R. Nelson Company 31 years ago, discusses new motor troubles.*

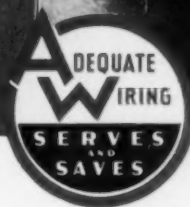
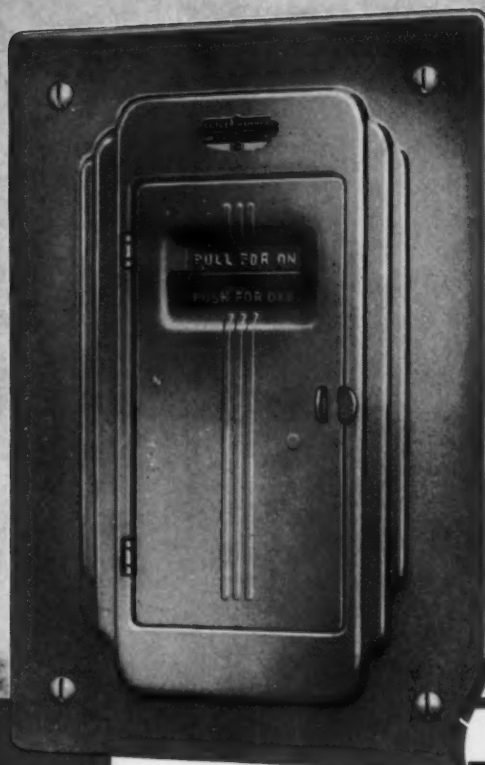
less of what this good will may cost. The most common reasons for trouble with new motors can be listed this way—

1. Installer has not oiled bearings.
2. Improper lubricants used.
3. Failure to insulate against noise.
4. Incorrect over-current protective devices cause frequent stoppage.
5. Wrong hookup—and motor won't run.
6. Inadequate voltage, because motor is too large for the wiring.
7. Motors placed on 110-volt circuits when 220 volt service is required.
8. Belts too tight.
9. Neglect of maintenance.
10. Misapplication of type as to starting, speed or duty rating.

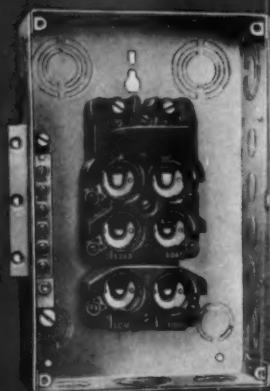
Qualified service shops are to be found in every community to handle these headaches at a fair price. They can be just as effective in keeping the motor sold as in selling it. Spare parts and complete special motors can be stocked in their shops, if a manufacturer needs to so protect a certain market or customer area. The procedure is simple. Authority to do work can be made clear and definite.

What is in it for the shop? Service calls of this sort will not become a large percentage of normal volume. But the work brings new contacts and increased prestige. Careful attention to new motor troubles shows the shop's ability to take care of the user's old equipment.



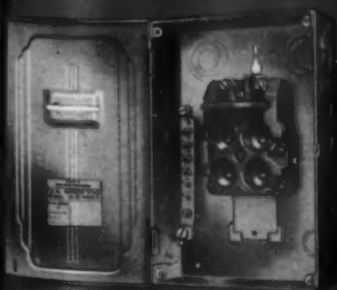
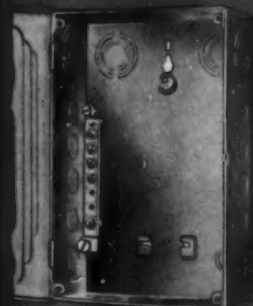


Another Cutler-Hammer Contribution to America's Adequate Wiring Program



### The C-H 30 amp. 4302 Fuseless Main Switch Saves Money 5 Ways

1. Everything comes out clean by loosening only ONE screw.
2. Well spaced terminal strip with solderless terminals.
3. More than average extra wiring space.
4. More than enough wall-out knockouts.
5. Guide-adjustable mounting bracket on flush type for ALL plaster levels.



## For Today's Biggest Market America's New Small Homes

A winner for beauty . . . a record-breaker for cost-cutting speedy installation . . . top quality at rock-bottom price

The new Cutler-Hammer 30 amp. 4302 Fuseless Main Switch so completely fills the bill for today's huge small-home building market that it simply has NO competition. Check it over yourself . . . compare its appearance . . . its price . . . the man-hour installation savings it offers . . . its safety . . . its convenience . . . its quality. *This switch has everything.* It's now in stock at all Cutler-Hammer wholesalers. Don't let this opportunity get away . . . The C-H 4302 is a money-maker. CUTLER-HAMMER, Inc., Pioneer Electrical Manufacturers, 1306 St. Paul Avenue, Milwaukee, Wisconsin.

### Check these

#### Star Features:

**LOOKS**—Styled with exceptionally good fast . . . it has no equal.

**SPEED**—Designed with every known feature to provide a better installation at cost-cutting speed.

**QUALITY**—Engineered and built to guarantee Cutler-Hammer standards.

**PRICE**—There is absolutely no comparable switch on the market at such low price.

### Prices?

Bulletin 4302-H1  
2 Branch Circuits  
List \$2.00

Bulletin 4302-H2  
4 Branch Circuits  
List \$6.50

Bulletin 4302-H3  
6 Branch Circuits  
List \$7.50

NOTE: THESE PRICES FOR SURFACE MOUNTING TYPE. FLUSH MOUNTING TYPE SLIGHTLY HIGHER IN PRICE.



# The Use and Care of MICA

**M**ICA ranks among the most important insulating materials because of the high temperature ratings it makes possible in present day electrical machines. This position is augmented by the fact that mica can readily be fabricated into forms suitable for the numerous applications peculiar to the electrical industry. These outstanding characteristics render mica useful in electrical apparatus—

1. Extreme heat resistance
2. High dielectric strength
3. Resistance to corona
4. Superior resistance to oil
5. Superior resistance to salt vapors
6. Does not deteriorate with age
7. Mechanical strength combined with flexibility
8. Least affected by combined heat, mechanical vibration, and voltage stresses of all classes of electrical machine insulation.
9. Requires no treating or conditioning since it is used in the raw state. Inorganic and non-fibrous when taken from the ground.

**Fabrication**—In fabricating mica into electrical insulation, it is used in the form of laminations or splittings, which

vary in thickness from .0005 to .0015 inches, and in size from a square inch or so to six or eight square inches. Fabricated types of insulation are produced by overlapping the splittings in layers and binding them together by means of various types of bonds.

In some cases backing and facing materials are required to impart additional mechanical strength as with coil wrappers and tapes which are applied without the aid of heat. The facing material usually consists of strong tissue paper .001 inch thick or cellophane. For the backing, treated or untreated paper or cloth is usually employed. The

**Some facts for shops to consider when insulating with mica . . . .**

**By L. B. Schmerber**

*Westinghouse Electric & Manufacturing Company*

fabricated forms in general use are:

1. Segment mica plate
2. Hot molding mica plate
3. Cold molding mica plate
4. Heater mica plate
5. Mica wrappers
6. Mica tapes
7. Mica tubes.

Thicknesses of these grades vary from .004 inches to approximately .125 inches. Their distinct applications are listed elsewhere.

**Grades of Raw Mica**—Amber or Madagascar mica, and white or India mica are the two general grades of the splittings used in electrical insulation. Because amber is physically softer than white mica, it can be used for insulation between commutator segments. Since it will wear down evenly with the copper under brush pressure, this eliminates the necessity of undercutting. In general the amber mica is suitable for operating temperatures up to 300 degrees centigrade and white mica up to 500 degrees centigrade.

**Dielectric Strength**—There is little difference in the dielectric strength of the two grades of mica. On the thinnest splittings, it is roughly 7000 volts per mil for the .0005 inch thickness, and 3000 volts per mil for the .004 mica thickness.

The dielectric strength of built up mica plates, tapes and wrappers, is not so great as that of solid raw mica. The dielectric breakdown values for mica wrappers, average about 450 volts per mil, obtained by the application of 2½ and 3½ turns of .007 to .010-inch wrapper to coils pressed to size. On mica plates the dielectric breakdown in volts per mil varies indirectly with the thickness, from 890 volts per mil for .0335-in. thickness to 550 for .1905-in. thickness.

**Storage of Mica Products**—In order to extend the useful life of mica plates, wrappers, tapes, etc. and to have the

(Continued on page 73)

## TYPICAL APPLICATIONS OF MICA INSULATION

MATERIAL	TYPE OF BOND	BACKING OR FACING MATERIAL	APPLICATION
Segment Mica plate	Heat-reactive. Sets under heat and pressure	None	Commutator bar insulation. White mica where commutators are undercut. Amber where not undercut.
Hot molding mica plate	Heat-reactive. Sets under heat and pressure	None	Commutator V-rings, collector bushings, general molding and forming, employing heat and pressure. Also washers and strips.
Cold molding mica plate	Plastic. Remains flexible indefinitely	None	White mica for temperatures up to 500° C. amber for temperatures of 500° C. to 800° C. For all heating app. such as flat irons, toasters, etc.
Mica wrappers and sandwiches	Plastic. Remains flexible a long time	Paper, treated cloth, cellophane	Armature coil insulation, end banding. Between end windings, slot cells, washers and protective pieces.
Mica Tapes	Plastic. Remains flexible a long time	Paper, untreated cloth, treated cloth	Taping strands, conductors and coils in armatures, taping field coils (cloth backed) also coil wrappers.
Mica Tubes	Heat-reactive. Cured in the manufacture of the tubes	From 0 to 50% paper	Insulation on bolts, studs, rods, etc.

WE CAN'T PERMIT  
DELAYS THAT HOLD  
UP PRODUCTION

PRODUCTION DEPARTMENT

WE CAN'T AFFORD  
TO SACRIFICE MO-  
TOR PROTECTION

ELECTRICAL DEPARTMENT

## G-E ISOTHERMIC CONTROLS *Satisfy Both*

**T**HE production manager is right—certainly his company can't afford to have equipment shut down and men waiting around every time some motor has a tough job.

The electrical superintendent is right, too—he's saving his company money by insisting that motors be protected from overloads that might endanger windings or bearings.

If the motors are equipped with G-E controls, neither department needs to worry. Isothermic overload relays protect motors from dangerous overheating, yet they keep

them on the line as long as they can be safely operated.

G-E motor starters meet the approval of electrical and production departments in other ways, too. They are sturdy—built to stand the gaff of industrial service with little maintenance and attention.

More and more plants are standardizing G-E magnetic control for all important motor drives because it satisfies the requirements of both the production and the electrical departments.



The general-purpose CR7006—standard control for motors in thousands of plants



▲ The CR7009 magnetic reversing controller for the push-button reversing of motors

◀ The CR7008, which combines magnetic control with a fused manual line switch in the same case

General Electric, Dept. 6D-201  
Schenectady, N. Y.

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GENERAL  ELECTRIC



# Editorials

Earl Whitehorne, Editor

## Code Study Essential

A forthright speaker at the recent meeting of the Illinois Chapter of the Western Section IAEI demanded that inspectors stop quoting routine code rulings to every contractor who phones in with a question: Tell them where to find the rule in the Code, he said, make them look it up themselves.

This was no dictatorial inspector talking. It was contractor Bill Templeman of Chicago, president of the Cook County Electrical Contractors Association. And he was dishing out some frank advice.

Busy contractors are inclined to take the easy way of calling the inspector. The inspector also finds it easier to give the information requested off-hand, than to refer the questioner to page and article numbers. Yet in the long run it would be easier for both, if the contractor used the code book for himself.

## Practical Tests Needed

License laws, requiring a written examination by contractors or their supervisors, raise an unusual examining problem. Because public safety is the first consideration of licensing, the examination questions must be based largely upon the applicant's Code knowledge. A good student with a smattering of knowledge about wiring, by boning on the Code for a week, could ease through most written examinations and qualify as a contractor.

Under Michigan's new practical qualification test, that loop-hole is effectively plugged. The written examination still provides the basis for considering the qualifications of the applicant but in order to take a written examination the applicant must first qualify by proving his skill in actual wiring tests. He connects motor circuits, fixtures and service en-

trances, identifies materials, points out Code violations on specially prepared test boards equipped with actual wiring materials.

In its brief history this test has eliminated more than half the applicants who faced it. It has an educational function as well. Embryo electricians who think that all there is to wiring is keeping the polarity straight and taping the joints, get a concentrated preview of what the electrician must be able to do. They leave sadder but wiser men.

## For Better Specifications

Next month *Electrical Contracting* will present a 48-page Editorial feature Section on Specifications. We believe it will be an interesting and constructive contribution. In a clear, useful way, it will show step by step how to plan wiring systems and write specifications for residential, commercial and industrial buildings. It sets up an orderly sequence and gives a pattern that any man can follow to be sure he has not left anything out.

Copies of this issue will be sent to leading architects all over the country because we believe this will be a service to the contractor. So if you want to be sure it reaches the architects in your city, whose specifications you have to figure on, send us their names.

## Four Ideas

Merchants desire four things before all else—1. They want to attract more customers into their stores. 2. They want to make their merchandise look worth the price. 3. They want to sell extra items to each customer. 4. They want to look successful.

A recent survey showed that in 80 per cent of the stores, better lighting

would help realize more and more of these natural ambitions. And contractors like to install better lighting. Well, here is something to talk about, four ideas to help you sell.

## This Hidden Knowledge

Most contractors cling to the old time idea that the art of estimating should be kept a dark secret. Each man, they seem to feel, should learn to figure costs by trial and error and then never tell. The idea is to keep his competitors from becoming skillful also.

But it was long ago discovered that the most dangerous kind of a competitor is one who is unskilled. For he takes work too low, depreciates values and everybody suffers. Therefore, the voluntary code of fair bidding practice is a successful, common sense form of cooperation. And it is smart to use the NECA labor unit tables. For the more experience you and your competitors can command in estimating, the better. There is still plenty of opportunity to be a better salesman and a better manager and get more jobs.

## Make it Better

Every electrical man has pricked up his ears over fluorescent tube lighting. Something new—to sell and install—new color, coolness, distinction. It opens up a brand new market.

But too many contractors in replacing mazdas with fluorescent lighting are content to install the same wattage. They fail to seize upon the opportunity to put more light, more load and more wiring into this store or home or factory, that would be directly benefited by a more liberal and effective use of well applied illumination. Why don't we do the whole job while we are at it?

## Running to Uncle

Auto dealers, steel supply dealers and others have been running recently to Uncle Sam's Federal Trade Commission over sales agreements between themselves and manufacturers. In our business, motor dealers and appliance dealers long have been complaining about the unprofitable nature of their sales agreements, but have done nothing about it. It might be smart for manufacturers to look into this

matter before there is more government intervention.

Healthy sales and discount policies that recognize the dealer's costs will correct such a situation before worse troubles start. Here is a chance for cooperation. Let's continue to run this industry ourselves.

## Car Salesmen Show the Way

Smart, these automobile salesmen. You never heard one of them say—"Let's see now, this car will cost you \$575 at the factory, plus \$100 for freight, and \$50 assembly charges here; then my salesman gets \$75 commission, and I need \$125 profit; that makes \$925 delivered to you."

Instead, they purr—"Give me your old car and \$25 a month and you can drive away in this beauty." Now—why not sell rewiring the same way?

There are just a few more months to clean up on modernization loans under FHA. Let's get going. But instead of giving an item figure for a new lease of electrical life to the prospect's house, wrap the job up in a package. Figure out the FHA terms, and say—

"Let me go in and salvage what I can of the old, and you can have a rebuilt, guaranteed adequate, complete full-comfort job for \$6.25 a month."

## Triple Threat to Harmony

Just as long as work is scarce will there be a crowded bidders list on public construction projects. For every contractor with funds or backing that will qualify him to bid is going to try his luck. Much of it goes ridiculously low. Great risks are taken. Too often somebody bought a job below cost to keep going, or to break into out-of-town-work.

Three common evils combine in this unhappy situation—1. Lack of price stability among suppliers of equipment and materials. 2. No standard methods or units employed in estimating labor. 3. Jobs taken "to keep the boys going" for whatever can be made out of it. Shake these three evils in your hat and you have chaos. Turn your back on them and there is fair promise of harmony and profit.

*Electrical Contracting, March 1939*

## What to Do?

One electrical contractor is prosperous and another is poor. One wireman is good and another is just so-so. The same with industrial plant electricians and motor-repair men. Why?

The principal difference is what the man knows, the usable experience he has to draw on when he needs it. It may be his own personal experience. It may be knowledge he has gained by watching others. It may have come from reading. But he has it. And in a pinch he knows what to do. On that foundation he builds his job, his reputation and his life.

Naturally all men do not have the same opportunity to gain broad personal experience. The size of the town, the kind of work done in the shop he starts in, all have a bearing on it. And then there's luck. But there is no luck in the opportunity every man has to gain experience by reading. He can get it if he really wants it. And that experience, coming from many men, is broader and more valuable than the knowledge most men pick up for themselves.

## Back Talk

### Crowded Starters

**To the Editor**—As a subscriber I offer a few words of protest against the extreme crowding of terminals and working parts in across-the-line starters and other equipment to secure compactness. This applies especially to newer types of controls for fractional horsepower motors in univert and similar service. Terminal strips are often jammed in small terminal boxes, affording no wiring space, and requiring special combination spinner socket wrenches which are hard to secure.

Harry F. Clemens  
Hadley Electric Service Co.  
Indianapolis

*This comment by Mr. Clemens is published for the benefit of manufacturers who are interested in constructive field criticism. After all, problems of installation and maintenance concern the manufacturer just as much as the man who uses the equipment. For the wise buyer of control devices weighs compactness against accessibility for making connections and repairs.*

### Optimism From a Friend

**To the Editor**—I just got your latest number and read it last night with a lot of interest, for there were a number of very pertinent articles in it. I was particularly interested in your article by Mr. Dandelake of the Miller organization in Jacksonville, Florida. I happen to know that Dandelake is one of the best estimators in this part of the country. He estimates a lot of work for Miller and he must be particularly good to get as much out as he does.

We always look forward to reading your paper, and I am optimistic about the general electrical situation as it exists today. I believe that the progressive contractor has many opportunities to advance his own business and the interests of his

customer if he will only be active and acquaint his customers with the many advantages that the use of electricity offers.

K. D. White

Walker Electrical Company, Columbus, Ga.

*Thanks, K. D. We know Mr. Dandelake will rise and bow also. Your optimism on the general outlook is welcome and we are glad to pass it along. Too many men forget to express their confidence and so the cry of the crepe hanger is heard too loud in the land.*

### 4 Cities Tell Truth

**To the Editor**—In the January issue of *Electrical Contracting*, the editorial survey "4 Cities Tell a Tale" was most interesting. The writer agrees with the summing up 100 percent. What you have written regarding the relationship between chief electrician, the contractor and the motor repair man is true of the National Co.

You state, "Only half the plants that maintained their own electrical staffs, are now making regular tests and surveys." Would you tell the writer just what these tests and surveys consisted of in the plants visited?

"In our own plant we have graphic ammeter records of all of our principal motor drives. We also take semi-annual ground resistance tests on all main feeders. I have been reading *Electrical Contracting* for more than twenty years. In my opinion, it is far better today than ever before."

Wm. J. Shea, Chief Electrician  
National Folding Box Company,  
New Haven, Conn.

*Half these plants, Mr. Shea, are making regular tests on resistance, voltage and power factor and they secure some graphic records. The others have failed to organize protective testing into their regular maintenance routine. They have some portable instruments, but for the most part only test for trouble when it comes.*

### Word From the Country

**To the Editor**—I live out in the country nine miles from the nearest village of any size and naturally draw my trade from my immediate vicinity. I do not draw any trade from the villages and do not attempt to. I have learned that the business men are very glad to have me come in and patronize their stores, barber shops, garages; but giving a country man any work is unthinkable. It is perfectly ethical, however, for their mechanics, carpenters and electricians to come into the countryman's territory and get the best of all of the business they can, however.

Now, I am not complaining, as I have been able to take care of myself most of the time. I do my work in a first class manner and I know from the repairs that I am called upon to make, that it is done just as well as by the city or village men. I use good materials, most if not all of them advertised in your magazine and we are subject to rather rigid inspection based on the Code.

As to cutting prices, when I figure on a job, I intend to make a reasonable profit on the materials I supply and get a reasonable price for my work. I have not had to lower my bids to get the business, but I can assure you that I might if I thought it necessary to hold my business.

"Most of the material that you publish is not adaptable to the jobs I am called on to do, but that is nothing against your magazine. I like it and would continue to take it if money were as plenty as one might wish."

W. B. Huston  
Hector, N. Y.

*This message seems to us both interesting and important. The entire electrical industry has too long thought in terms of city and town work and forgotten our friends in the country. Now with so many REA and power company lines extending down the rural highways, two things must happen. Manufacturers, wholesalers, contractors and utility men will be giving more thought to serving these country customers. Also, the country contractor is going to be able to get more money for better work.*



# WIRING

## Methods

### STOCK BIN TRUCKS

This service and repair truck of the Wigdahl Electric Company of Chicago, Illinois carries a large stock of parts and tools for handling any type of repair calls received. It is equipped with stock bins built into the sides of a truck body interior. A posted list of materials at the shop shows what materials are carried in the truck and one man is responsible for replenishing the stock every day.



**SIDE WALL BINS** lining the sides convert this repair truck into a rolling stock-room.

### COLLECTING CONTROL WIRES

When the Edison Institute of Technology was built in Dearborn, Mich., the machinery room layout included a neat metal-clad remote control and gauge board for eight adjustable-speed roof fan motors. A workmanlike connection was made to the rear of this board from eight concealed conduits containing 108 No. 12 conductors, which ended in junction boxes set flush in the tile wall.

The McCleary-Harmon Company of Detroit installed three 4 by 4-in. wireways from upper split covers of the flush junction boxes to terminal blocks



**TROUBLE - FREE CROSS - OVERS** — Neat rear-of-board connections for 108 motor control and pilot wires make future trouble shooting easy.

at the rear and top of this gauge board. Since the conduits were already paired out, the 108 conductors could be routed

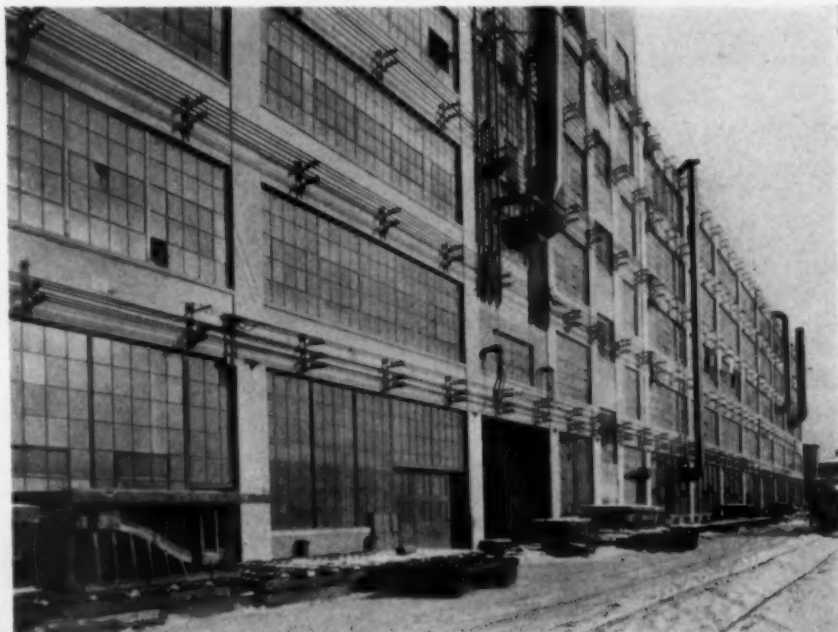
to their proper terminals with minimum cross-overs. The board itself is free-standing, dead-front, and has steel doors at both ends for access to rear connections.

### OUTDOOR FEEDERS FOR EVERY FLOOR

Automobile plants make frequent changes in machinery, ducts and piping which often necessitates expensive re-routing of heavy feeder runs. This view of a five-story building at the Packard Motor Car Company plant in Detroit shows the outdoor feeder methods employed to overcome this problem. Here one or more 500,000 c.m. triple braided weatherproof feeders were run horizontally on brackets along the building, at each floor level. Wherever a new load center was to be placed a short feeder run was extended out a window panel and tapped to an outdoor feeder.

The riser conduits appearing along the outside wall are the supply runs which terminate in weather-heads at the mid-length of each outdoor circuit. These risers originate in a feeder distribution room located directly over the dark grilled space, where nine transformers are located.

Further advantages of this wiring method are: outdoor-ventilated conductors, standardization of cable sizes, freedom from mechanical injury, saving of ceiling and column space, and minimizing holes cut through floors and partitions for the conventional exposed feeder runs.



**ADEQUACY AT THE WINDOWS**—Horizontal feeders outside this auto plant building provides numerous economies.



RUBBER SIDE

FRICTION SIDE

ANNOUNCING...

# U.S. Twinsulation

A COMBINATION FRICTION AND RUBBER TAPE

YOU USE LESS TAPE  
YOU HAVE A FOOLPROOF JOB

IT'S SAFER—tests prove that a single thickness of U.S. Twinsulation will withstand from 7,500 to 10,000 Volts. Approved and Listed by the Underwriters' Laboratories. LASTS LONGER—gives maximum resistance to moisture, heat, cold, and abrasion. ECONOMICAL . . . One ply of U. S. Twinsulation is equivalent in dielectric strength to at least six plies of regular Friction Tape. UNIFORMITY—The fabric base prevents stretching, assuring uniform thickness. SUPER-ADHESION—Cannot be duplicated in any other tape. SIMPLER—easier to apply—makes a permanent, foolproof splice . . . the rubber provides the insulation, the fabric provides the strength.



Listen In! Raymond Paige, 99 Men and  
A Girl, Wednesdays, C.B.S.—10 P.M., E.S.T.,  
9 P.M., C.S.T., 8 P.M., M.S.T., 7 P.M., P.S.T.

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1. Magnetic Motor Starter (push button operated).
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Safety interlock protects workmen from accidental contact with live parts. Easily and quickly mounted on machine panel or wall. Saves conduit, saves wire, saves labor cost. Gives your customer dependable motor starting, saves him lost production time due to fuse outages. Recommend the Westinghouse Combination Linestarter and identify yourself as the contractor who is right up to date.



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STOCKS 'EM!



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ALL SIZES AND MOUNTINGS  
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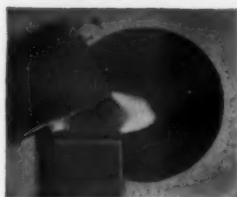
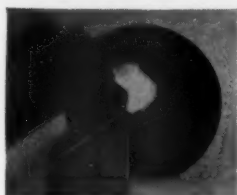
Westinghouse Push Buttons are stocked by your nearest Westinghouse Wholesaler, the size and type you need delivered on the job when you need them.



# Westinghouse



# MONEY MAKERS



ASK YOUR  
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DEMONSTRATE

## MAINTENANCE REDUCING FEATURES JUSTIFY THE USE OF A GOOD SWITCH

When you bid on the lowest price switch, whether or not you will get the order depends on how little profit you'll take. To protect your profit recommend the Westinghouse Safety Switch. It costs no more than other good switches yet it has features that will break down a strictly price bid.

- diamond pointed jaw and extended blade confines arc to noncurrent carrying parts.
- one-piece copper construction reduces heat loss.
- "De-ion" arc quenchers in 575 and 600 volt switches prevent dangerous flashover, prolong contact life.

Protect your profit with these features in the Westinghouse Safety Switch.



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## "DE-ION" MOTOR WATCHMAN

A low-cost manual starter for motors up to 7½ hp:

- Toggle switch indicates "On" "Off" and "Tripped" positions.
- "De-ion" Arc Quenchers protect from flashovers, prolong contact life.
- Safety interlock prevents accidental contact with live parts.
- Bi-metal disc relay protects motor from overload.
- Knockout space in top, sides, bottom or back of case.



SHE'S A BEAUTY!

J-20821

## • FOR YOUR CUSTOMERS BOTHERED WITH FUSE OUTAGE DELAYS

Here is the answer for the customer who is bothered with production time losses due to fuse outages. The Nofuze Circuit Breaker provides positive circuit protection without fuses. Plants report savings as high as \$3,000.00 from Nofuze installations.



BUILDS YOU UP  
WITH YOUR  
CUSTOMERS

## NOFUZE CIRCUIT BREAKERS

# Packaged Control



# Motor Shops

## INTERESTING JOBS FOR SPECIALISTS

Detroit is said to have about 500 places where motor repair service of some kind can be obtained. With such wide opportunity for competition, it behooves larger organizations to seek out special, tough jobs to do. All interesting, some of these tasks involve ticklish problems of design, application, and often some manufacturing. Here is one of them, a tool demagnetizer outfit, that was snapped at the Miller-Seldon Electric Company shop just before being sent out to a plant on its shipping skid.

The demagnetizer has become very necessary to high-speed metal working. It seems that modern tool steels used as dies, gear cutting knives, shaft shavers, and the like become heavily mag-



**CLOSEUP**—Opposing magnetic fields neutralize residual magnetism in steel parts placed on slotted aluminum tray. Fins on pole pieces help to radiate excess heat from imbedded coils.



**DONE IN A SHOP**—A Detroit shop does special design jobs like this demagnetizer for tool steel.

netized in use. When cutting tools become heavily saturated the clumps of clinging metal particles or turnings are a hindrance to fast-moving operations. The steel's density and hardness requires special equipment to restore it to its natural state.

Here is a 150 amp., 440-volt job employing a steel channel A-frame. Opposing magnetic fields are set up in the two pancake-shaped castings containing special windings. The operator's crank draws these fields toward a slotted aluminum tray upon which steel parts are placed. Current is supplied to the coils through vertical busses placed in the webs of the channel framework. A limit switch closes and opens the magnetically operated contactor which controls the demagnetizing pole pieces. Small pieces of tool steel are only exposed to this treatment for short periods.

## EVERY TOOL IN ITS PLACE

Every motor repair shop carries a stock of special tools, drills, taps, dies, and machine accessories that represent a substantial investment. It is hard to store these so that selection is easy. Globe Electric Works, San Francisco, has solved this problem.

In the locked tool room, space is saved by use of a compact rack built of pipe and angle iron, on which several shelves of heavy gage steel are slanted toward a center support. Along the under side of each of these shelves a lamp socket is mounted in the conduit which forms the center horizontal support. This light is controlled by one of four toggle switches at one end.

To hold the drills, three 2 x 6 wooden boards are drilled along the top with holes in which to insert the drill. Opposite the drill hole a shallow circular hole was drilled in which to insert a box knockout on which has been punched the size of the drill above it. These boards were then stepped on wedge shaped supports, as shown in one of the pictures, to provide free access to each drill. For large taps the plank, already drilled to accommodate the various sized taps, was split down the middle, making a series of grooves in which the taps rest.

This visible arrangement permits



**DRILL RACK**—Holes for each drill, tap or die, size markers, and adequate illumination make this orderly arrangement of tools easy to use.

quick inspection to see that tools are returned to their places, saves time lost fumbling through miscellaneous assortments of tools in boxes or drawers, and has a tendency to stimulate neatness among shopmen. Designed and built by Lloyd Flatland, it has more than paid for its cost.



## **PANTHER *and* DRAGON TAPES**

1. First to be Wrapped and SEALED in Cellophane.
2. Perfect Adhesiveness and Tensile Strength.
3. Strong Distinctive Green Core.
4. Colorful Attractive Boxes.
5. A Company in the Insulation Business Since 1878.

**HAZARD INSULATED WIRE WORKS**

DIVISION OF THE OKONITE CO.  
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Philadelphia Atlanta  
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San Francisco St. Louis Los Angeles





## SAVING THE LAYOUT

Many of the jobs to be estimated must first be circuted and otherwise laid out before take-offs can be made. Since the plans are usually returned with the contractors bid, or before that time, the layout work is usually erased from the drawings. Thus the contractor loses a record of how he planned to install the work, unless some method is devised by which to save the layout. The most common method employed for saving job layouts is to make a rough pencil tracing of the floor plan, showing thereon how the work was planned.

The extent to which tracings are prepared while bidding on jobs varies considerably among contractors. Relatively simple jobs are rarely copied, nor are those electrical layouts copied that have been carefully and clearly drawn by the architect or consulting engineer.

The most common practice is to mark up the drawing with yellow crayon, for estimating purposes. Upon completing the take-off, a thin sheet of tracing paper is laid over the drawing. Home runs are shown as planned to the first two or three outlets all over each floor. Routings of feeders, locations of junction boxes and other important phases of the job are also traced in. If the plan is returned for estimating a change in layout, these sketches help to guide the estimator in re-figuring. Such rough sketches are of still greater importance when the job is secured.

## LABOR CHECKUPS MADE SIMPLE

To know how actual labor costs are proving out in comparison with the original estimate is important to every contractor and estimator. The Miller Electric Company of Jacksonville, Fla., has a checking system which simplifies

this matter for its various jobs. Here is the way J. Dandelake, estimator for the company explains it—

The electrician foreman at each job reports all material installed in the job during the week. He sends a copy of this material installation schedule with his weekly payroll. From his copy he also checks with the job inspector the work installed during the month. The inspector uses this schedule in establishing the monthly requisition, if he has been fully satisfied that the material listed was actually installed. If he objects we have reasons to believe that the electrician has mis-reported the job and we make a check ourself by means of a stock inventory.

To the electrician's report of material installed, the labor units used in the particular estimate are applied to the quantities specified. Some weeks will indicate a saving, others will indicate that he is behind time. If we have four straight weeks which indicate that he is losing time, and there is no sur-



**FLUORESCENT DAYLIGHT** — Estimating rooms are becoming the proving ground for many electrical contractors with regard to the efficiency of fluorescent daylight fixtures. Here we see Edward J. Murphy, estimating and layout man for E. G. May of Albany, N. Y., at work, while a 36-in., 220-volt unit makes blueprints easy on the eyes. Two reflectors are provided at this location, each on pipe brackets that slide through holes in the partition for adjusting the light close by or toward the rear wall.

plus from some previous week to compensate for the difference, we take immediate steps to replace this electrician. If he is one who has been with the company a number of years we send him to another type job where he will be able to keep up.

These weekly reports appear something like the following:

Report Week Ending		Jesup Post Office.	
July 2, 1938			
200 ft. 3/4" conduit.....	140c	2.80	
230 ft. 1/2" conduit.....	2.00c	4.60	
22 4" oct. Boxes.....	.20c	4.40	
19 4" sq. Boxes.....	36.00c	6.48	
32 1/4" L&B.....	20.00c	6.40	
48 3/4" L&B.....	30.00c	14.40	
Total .....		39.08	
plus .20% .....		7.81	
		46.89	

By pricing out the electrician's report from the labor units employed in the estimate, the results are easily compared with the actual payroll. On this job our cost was 40 hours at \$1.00, or a total of \$40.00. This indicates a saving of \$6.89 during that particular week. By the simplicity of this method of checking it is possible to keep an accurate check with the minimum amount of effort. Electricians generally are not going to prepare complete reports no matter how hard one tries to make them do it. However, with this simple method we have never experienced any trouble in getting them.

When men are required to report so many hours on each size of conduit, each classification of runs, each particular cabinet, etc., the results are generally so messed up that the office never has a true picture of the job. The result is a lot of spent time and nothing accomplished.

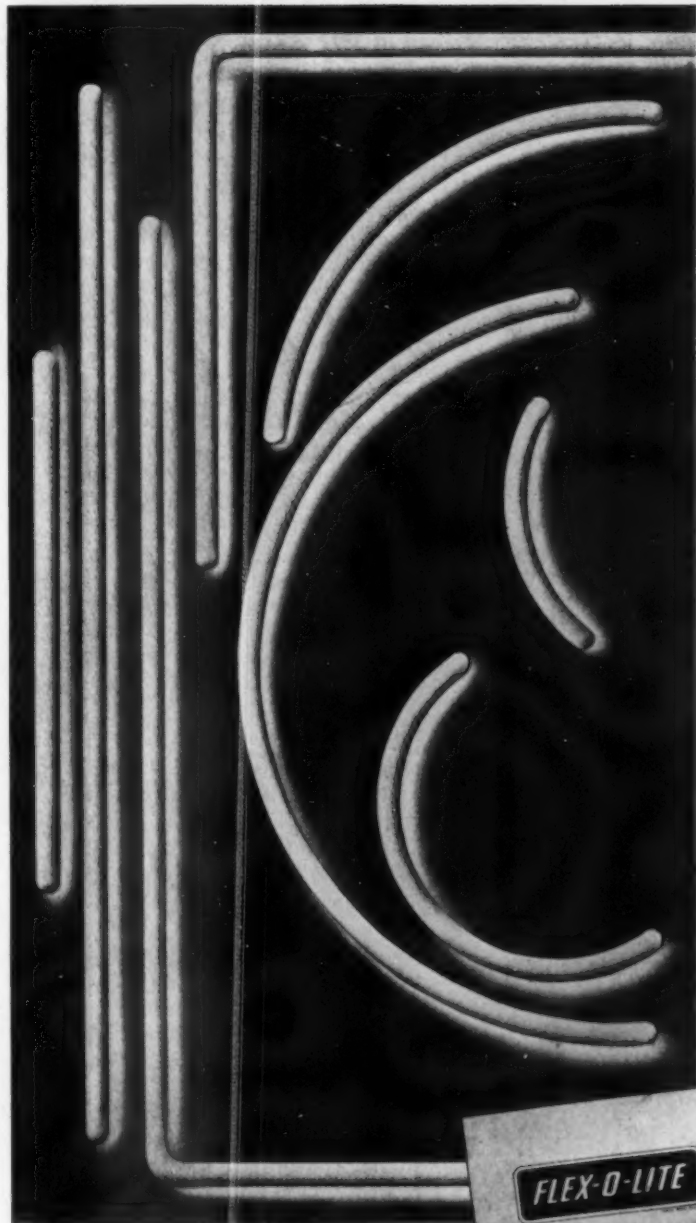
## APPLYING UNITS TO COVER JOB TRIPS

The question often arises how various labor units are worked out so as to cover the variables of frequent trips that must be made to certain jobs before their completion. There can be but one answer, to figure "labor" as on-the-job conditions and add the extra or non-productive labor costs that will be incurred in making four to eight trips during the progress of a job. For instance, two 80 man-hour jobs may use a very similar list of materials. But in one job it may be possible to work through to completion, while a gas service station or residence, for example, may require five or six or more different trips from the shop before all work is done.

So to cover this non-productive labor cost, it is necessary to size up the work, judge the probable number of times your men will work there, and allow in addition a fair amount of lost



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**FLEX-O-LITE**  
TRADE MARK REG.

## *CUSTOM-MADE Fluorescent Lighting*

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You can capitalize on this new market to greatest extent with FLEX-O-LITE. Its unique adaptability and low installation cost offers you an opportunity to sell practical and decorative Fluorescent Lighting to a maximum number of prospects.

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R. A. Warren, President

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EC-3



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All it takes is a quarter turn to release or attach this reflector . . . no screws, nothing to loosen or corrode. That's what makes it easier to service—and much simpler to install. You have only to wire the socket and attach to the hood. After that, you merely snap the reflector in place and the job is done.

### "COME-APART" DESIGN

Since the resilient socket is also removable, it can, if damaged, be replaced for a few cents. This socket is spring-mounted to absorb vibration and lengthen lamp life.

Seprable Reflectors are finished in permanent porcelain enamel and offered in a variety of styles. Write us for literature.



MEMBER OF R. L. M. STANDARDS INSTITUTE

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ELECTRIC COMPANY

OFFICES IN ALL PRINCIPAL CITIES

GENERAL OFFICES AND FACTORY: 2902 N. OAKLEY AVENUE, CHICAGO, ILL.

*Estimating*

[FROM PAGE 30]

time to cover your actual cost. Labor units cannot be set up that will absorb the lost motion encountered on one job, yet also be accurate for the uninterrupted type of work of another job.

### CHECKING ON JOB COSTS

A loose-leaf binder filled with 8½x11-inch entry sheets contain the work-in-progress data of every large electrical contract undertaken by Hillebrand & Owen of Syracuse, N. Y. The purpose of this binder is to provide a readily accessible source of information regarding any particular job without having to disturb the regular bookkeeping records. R. J. Owen, says this memorandum record system permits making a quick check against the accumulated costs at any stage of work. Here is the way the records are set up—

1. When a new contract is secured, a tab-marked sheet is inserted in the binder, bearing the name of the job, address, and amount of original contract. This page becomes the entry sheet for listing all subsequent extras, credits and work secured on that job from other sub contractors. A column at the right-hand side of this sheet is reserved for showing all billings made against the job.

2. When work commences, additional pages are added to this tabbed section for entering daily all charges made against the job. These pages have a date column, an entry column and four ruled columns for figures. Headings are noted on these sheets for: materials; cash discounts earned; labor; freight, express, parcel post and cartage; telephone and telegraph; travel expenses and board; bonds and permits; insurance; credits and price errors; freight and express charged back to vendor.

3. Every invoice for materials sent to this job, total payrolls, and other similar charges are set up on this memo record by the bookkeeper. If material is sent from stock, a lump sum entry of its total cost is likewise charged in the same manner.

4. Accumulative totals are kept up for these entries to provide the estimator or any member of the firm a ready check-up record. It tells how the payrolls are using up estimated labor, what is happening in the way of material costs, and also how job expenses are running along.

*smooth sailing*  
with  
**TRIANGLE**



*Specify!*  
**TRIANGLE**

AS SMOOTH AS A GUN BARREL!

**EMT**  
*Electric Metallic*  
**TUBING**

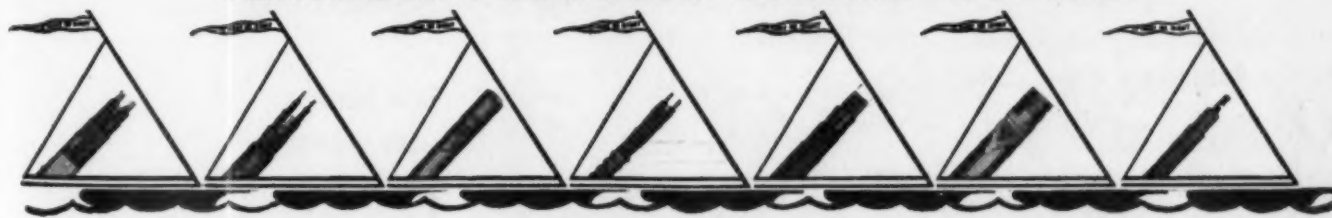
**HOT DIP GALVANIZED!**  
*Inside and Outside!*



**BAKED-ON LACQUER FINISH!**  
*Inside and Outside!*

... AND IT COSTS NO MORE!!

**TRIANGLE PRODUCTS REWARD BUYERS!**



**TRIANGLE CONDUIT & CABLE COMPANY, INC.**

Horace Harding and Queens Blvds.  
Elmhurst, New York City, N. Y.



# Questions ON THE Code

Answered by  
**F. N. M. SQUIRES**

Chief Inspector New York Board of Fire Underwriters

## Protection Between Buildings

**Q.** "On Section 2306, would a single pole toggle switch serve the purpose as main control switch ahead of all other switches in out building? Or is it the intent of the Code to use a fused externally operated switch? If so, should it be grounded if the wiring is non-metallic?"—L. T.

**A.** Section 2306 requires that each feeder running from a master service in one building to another building have proper overcurrent protection and separate control. The control, if not a circuit-breaker, should be an enclosed externally-operable switch. A toggle switch is an enclosed externally-operable switch and if one is selected of proper capacity it should be acceptable. For a two wire 125 volt circuit using one hot wire and a grounded wire, a single pole switch would be sufficient.

The location of this control switch is somewhat optional as it may be located in the building served or elsewhere, providing it is accessible to the person using the installation. If it is located at the master service location it could be a fused switch, but if located elsewhere it would not have to be fused as the feeder must be protected at its point of origin, which would be at the master service. If the wiring is non-metallic clad the enclosure for the switch need not be grounded.

## Service Conductors Within Walls

**Q.** "Article 230, paragraph 2331, of the 1937 N.E.C. regulations in fine print states, 'Service entrance conductors should not be run within the hollow space of frame buildings unless provided with automatic over-current protection at their outer end.'"

"Does this mean that service entrance conductors in heavy wall or thin wall conduit or approved service entrance cables, should not be installed within the hollow spaces of frame buildings unless over-current protection at their outer end? Or does this recommendation refer to open service entrance conductors only?"—W. K. B.

**A.** To enter a building service entrance conductors must naturally run through a wall from the outside to the inside of the outer wall. The fine print note referred to above means that, while the service wires are permitted to pass through the wall they should not run around, up or down within the hollow space of the walls of frame buildings, whether in conduit, electric metallic tubing or as open wires or in cables.



**COAST LEADERS**—Heading the new officers of the Electrical Contractors Association of Northern California are Kenneth Ryals (right) of San Francisco, president; and R. Goold of Stockton, vice-president. The association met recently with electrical inspectors of the Northern California Chapter and discussed business opportunities and installation problems incident to fluorescent lighting. This contractor group is active in promotional work in wiring, industrial modernization and lighting sales.

## Switch Ahead of Starting Switch

**Q.** "On motor hookup, as listed, is it compulsory to install disconnect ahead of thermal hand operated switch? This is a 5-hp. motor, 3-phase, direct connected to a peanut grinder. Three No. 10 wires in  $\frac{3}{4}$  in. conduit connect to 3-pole branch cutout in feeder panel located in basement and accessible to 1st floor, then run up through floor and connected to Allen Bradley No. 906 hand operated thermal switch with on and off push buttons on front of switch and then direct to motor. This switch breaks all 3-sides of line."—E. T. C.

**A.** The above switch is described in Bulletin 609 as one in which . . . "Pressing the Start" button closes the contactor mechanically through a quick acting toggle lever . . . Pressing the "Stop" button . . . mechanically opens the contactor . . . and disconnects all leads to the motor."

It will thus be seen that the switch in question complies with paragraph 4407a of the Code, as it is an air break switch, operable by applying the hand to a lever or handle. It opens all ungrounded conductors to the motor and, therefore, may serve as both the controller and disconnecting means for a motor without another switch ahead of it.

## Cleats or Knobs

**Q.** "3204 (d). This rule states that cleats cannot be used to support conductors operating at over 300 volts. What must be used when the voltage is 301 to 600 as allowed in rule 3205? Don't they allow single wire cleats any more?"—R. B.

**A.** This rule really refers to multiple wire cleats which generally provide separation of  $2\frac{1}{2}$ " between wires and  $\frac{1}{2}$ " from surface wired over. These would, therefore, not provide the required separation for 301 to 600 volts of 4" between wires and 1" from surface wired over. There should be no objection to the use of single wire cleats, as long as the wires are kept at the required separations.

## Farm Yard Light Control

**Q.** "Yard light wiring is a problem. What is the Code interpretation concerning yard light controls of the 3-way system? The Code says

# the PROFIT is yours FOR KEEPS

WHEN YOU INSTALL A SANGAMO TIME-SWITCH



A time-switch is only as dependable as its motor. The low-speed, 240 R.P.M., high-torque, self-starting motor of this KAZ Astronomic Dial Time-Switch, is one reason why so many contractors insist on "Sangamo" when a substitute is offered.

Here you see how a precision gauge checks the clearance between the rotor magnet and the stator plate of a Sangamo Time-Switch Motor. This inspection assures a free-running motor with sufficient and standardized torque. It safeguards, too, that you will not have to make a "free", profit-consuming service call later. Thus, not only superior design, but precision production methods . . . painstaking inspections . . . exhaustive tests . . . are your guarantee that the profit is yours *for keeps* when you install a Sangamo Time-Switch.

**SANGAMO**  
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*For Better Work and  
More Profits*

**Put GREENLEE  
Timesaving Tools  
on the Next Job**

By using Greenlee Timesaving Tools for bending conduit, enlarging knockouts, pulling cable, pushing pipe, and other operations, much can be accomplished in the way of efficiency and much can be done to insure more profits. But that isn't all. In most cases it means that better work will be done on each job.

We know all these things to be true because so many users of Greenlee Tools have told us so. In fact many have told us that certain of these tools have more than paid for themselves on the very first job.



**Cable  
Puller**

This new tool has won the approval of all who have seen it in action. It clamps right to the conduit through which cable is to be pulled. Can be used in any position, is readily portable and has two operating speeds.



### Hydraulic Conduit Benders

Greenlee Conduit and Pipe Benders are timesavers from the word go. Not only do they do the job in a hurry, but they make a smooth, even bend, and they save the cost of many manufactured fittings.

The rigid conduit bender, shown above, is made in two sizes for conduit from 1½ to 3-inch and from 3 to 4½-inch. The smaller bender can also be fitted with a set of attachments for bending 1½, 1½ and 2-inch thin-wall steel conduit.

### Do You Have a Copy of Catalog No. 31-E?

If you have a copy of this new catalog, you will find these tools and a number of others described in it. If you don't have a copy, ask for one now. It shows the way to efficient conduit bending, cable pulling, knockout enlarging, pipe pushing and various other operations. The attached coupon is for your convenience.



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Rockford, Illinois

Use this Coupon and Save Time

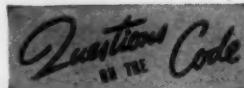
GREENLEE TOOL CO., ROCKFORD, ILL.  
Please send information on the following tools:

☐ Conduit Benders ☐ Cable Puller ☐ Knockout Tools ☐ Radio Chassis Punches  
☐ Joist Borer ☐ Electricians' Bits ☐ Bit Extensions ☐ Pipe Pushers  
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Name ..... Address .....

City ..... State .....

My Jobber in ..... E.C. 3-39



[FROM PAGE 34]

something about all wires of an a.c. circuit being in the same conduit. It also mentions that remote control wires may be run in the same conduit with power wires when they both get their current from the same source. The inspector demands that yard light remote control wires enter buildings through a separate conduit. Are these yard light wires considered of a different circuit? The inspector wants the yard light wires to enter the fuse box only through a separate conduit."—T. L. E.

**A.** Section 2308 rules that other wires shall not be installed in the same conduit with service wires entering the premises from the utility's line. But there is no other rule prohibiting wires of different circuits from being in the same conduit. Section 3013 provides that wires of different systems shall not occupy the same conduit. But different circuits do not constitute different systems. Hence yard light wires may be in the same conduit with power wires or other wires, provided they are all supplied from the same service. Wiring for 3-way switches must be installed in accordance with Section 3802.

### Receptacle in Ironing Cabinet

**Q.** "Is it permissible to install a receptacle outlet for an electric iron inside of a built in cabinet for an ironing board in a private dwelling?"—L. H. C.

**A.** Section 4241A requires that the disconnecting means for an appliance "shall be readily accessible to the operator of the appliance." This condition is met when the device (iron) is in operation as the cabinet is then open.

### Underground Wires

**Q.** Is it permissible to use steel tubing underground with lead-covered wires, or just plain lead-covered wires alone for 110-220 single phase?—G. K. B.

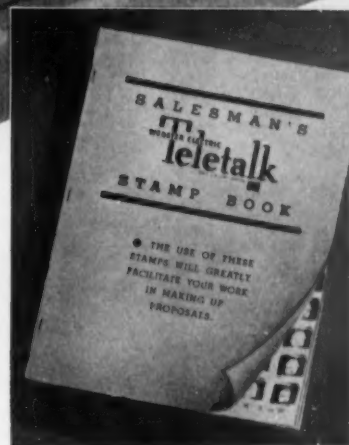
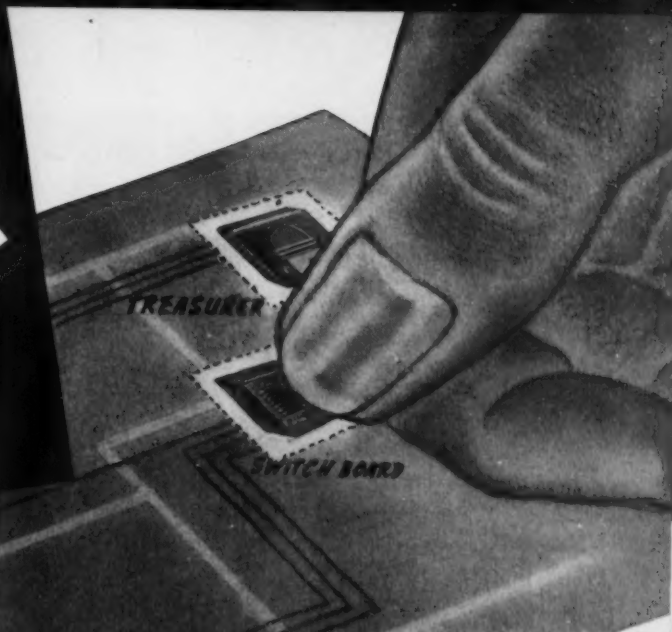
**A.** Electric metallic tubing with lead covered wire may be used for underground work with certain exceptions as stated in Section 3482.

Plain lead covered wire is not approved underground unless it is placed in an approved protective raceway.



here's Plus Profit in  
Labor and Material  
when  
you  
sell

WEBSTER ELECTRIC  
**Teletalk**  
REG. U.S. PAT. OFFICE



*This is the Teletalk Stamp Book. Ask your Graybar salesman to show you how to use it for easy selling*

## ... and proposals are easy to make

The increased need... and demand... for inter-communication in every line of commerce, business and industry opens a new profit opportunity for the electrical contractor. Teletalk... the new, modern method of inter-communication, enables you to sell every line of business... both large and small. The profit on the sale of Teletalk is good... and there is a plus-profit in the sale of material and labor. This makes it an ideal selling proposition.

Most important of all, here is a new, untouched market. Your fellow retailers, your jobbers, the public, and commercial buildings and the industrial

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plants in your city... all are prospects for Teletalk. And Teletalk is easy to sell. The plan above is typical of the method you can employ. The Teletalk Stamp Book illustrated here makes it easy for you to lay out these floor plans so your prospect can see just what he is getting. There are five different Teletalk models... in two different circuits... that permit as large or as small a

system as your customer desires. Every possible combination is available. Talk with your local Graybar salesman about Teletalk. He can show you how to make money with it.



*The model illustrated at the right is the Model 224. It has a capacity of twenty-four stations. At the left is Model 105. It has a capacity of five stations.*

**WEBSTER ELECTRIC COMPANY**  
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Standard Surface Design;  
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You can now keep your stock of plates *complete* with ONE surface design. Any number of gangs as listed — any listed combination of openings — matching all other plates using the **UNILINE** trade-mark... This gives a new flexibility to your stock; no holding up jobs to match designs of numbers you are short of. You may choose from brown Bakelite or cream-tinted white **IVORYLITE** in plates of **UNILINE** design. New data-sheet brings complete listings of the **UNILINE** universal trade numbers.

**HART & HEGEMAN DIVISION**  
THE ARROW-HART & HEGEMAN ELECTRIC CO. HARTFORD, CONN.



## FOR INSTANCE TAKE INSTRUMENTS

THE use of indicating and recording instruments in electrical maintenance operations is increasing steadily. More plants are setting up a regular routine for checking up on system conditions. Management is finding out that graphic instruments, keeping tab on the performance of machines or departments, bring vital data on efficiency and production.

So instrumentation looms large in the maintenance man's responsibility. His knowledge of this testing equipment, and how and why and when to use it, becomes more important. Therefore, we set down briefly in this series of Guide Sheets on Maintenance Practice a review of instruments—types, application and care. Use it to check your background knowledge.

This series of articles began in January, 1938, with a frank review of the electrical maintenance man's job. Then came—

1. Alternating Current Motors—Types and Applications
2. Direct Current Motors—Types and Applications
3. Alternating Current Motors—Maintenance
4. Direct Current Motors—Maintenance
5. A.C. Motor Starters and Controllers—Types and Applications
6. D.C. Motor Starters and Controllers—Types and Applications
7. Maintenance of Control Equipment
8. Special Control Problems—Heavy Installations and Maintenance
9. Electric Distribution—Circuit Protection—Power Factor Correction
10. Lighting—Applications and Maintenance
11. Electric Heat—Types, Applications and Maintenance
12. Electric Welding—Types, Applications, Control
13. Interplant Communication—Types and Common Maintenance Problems
14. Instruments—Types, Application, Care (this issue)

Coming articles will discuss

15. Power Tools—Types, Application, Care
16. Batteries and Rectifiers—Types and Maintenance
17. Electroplating—Maintenance Aspects
18. Electronic Devices—Types and Applications

# Electrical Maintenance

## Electrical Instruments

### Types, Application and Care

**D**ATA is needed on plant operation, on the condition of the electrical system or on the performance of some department or machine or small device. So the man responsible must know the various types of instruments and accessories, where they can be used, factors that control their selection and how to set up for tests. For this reason a review of instruments that help in maintenance is of value.

As more machines are added to production lines and the plant grows, the maintenance man's job increases proportionately in its complexity. More surveys and tests are necessary. Electrical instruments become indispensable tools.

#### Types

Instruments and meters are available for all possible measuring purposes on maintenance or production work. The four general classifications are—portable, laboratory standards, switchboard, and socket. Their names imply their use.

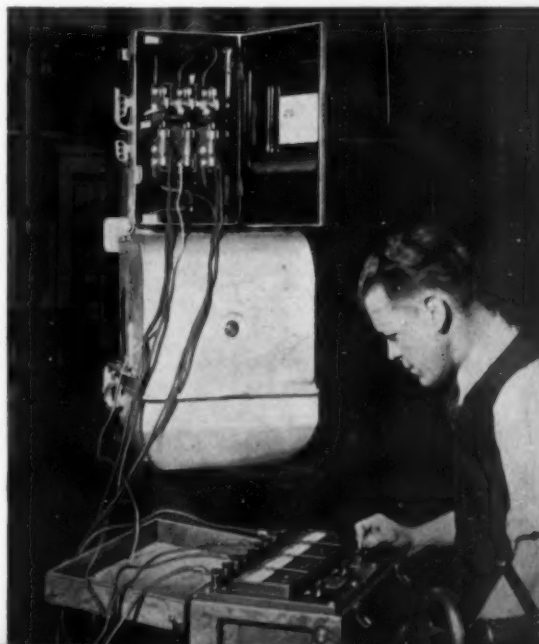
Indicating instruments indicate the present value of the quantity. Recording instruments record the measurements over a period of time. The latter has a chart which is operated by a spring-wound clock or a synchronous motor-driven clock.

Electrical measuring instruments and meters most commonly used in plants for system checks are—ammeters and voltmeters designed for use on a.c. or d.c. circuits or both, single-phase and

polyphase wattmeters, power factor meters, demand meters, watt-hour meters, and voltohmmeters or megohmmeters for checking insulation resistance.

The socket or detachable type instrument has recently been put on the market. It is intermediate between the permanently mounted switchboard and portable types. The instrument has prongs on the back and can be plugged into any desired circuit which can be permanently equipped in advance with an inexpensive socket outlet. This

**MOTOR ANALYSIS** in making plant surveys requires facilities for obtaining data quickly. The industrial analyzer checks ampere and watts load, power factor and voltage of a.c. circuits in one compact assembly of indicating instruments. (Weston Elec. Inst. Corp. photo)







**INSULATION TESTS** of motor windings and conductors of the plant wiring system are an aid to preventive maintenance. This reconditioned stator is being tested with a megohmmeter for insulation resistance. (James G. Biddle Co. photo)

type eliminates the work of opening conductors and connecting instruments and meters. The detachable type fits in with the modern practice of operating machines efficiently by use of instruments connected permanently or semi-permanently in the electrical circuits.

In addition to the usual line of instruments for testing, the maintenance man may require a frequency meter, synchronizing meter, cable tester, portable Wheatstone bridge, and oscillograph.

An industrial analyzer convenient for survey purposes can be used on single, two, and three-phase circuits. It consists of an ammeter, voltmeter, wattmeter and power factor meter, connected and mounted as a unit in one case.

Besides the electrical measuring instruments for the plant power system, there are other instruments which can be used in production and maintenance work. Some are:

1. *Electric tachometer* for measuring speed. It is a combination of a d.c. generator and d.c. voltmeter calibrated in speed units.
2. *Temperature indicators* for measuring temperatures ranging from 50 deg. below zero to 3,000 deg. F. There are two types—bridge and thermocouple. The former is usually used for low ranges up to approximately 400 deg. F. The latter is used for high temperatures up to 3,000 deg. F.
3. *Thermocouple ammeter* for measuring high frequency radio currents up to 100 megacycles.
4. *Sound-level meters* for noise measurements.

5. *Sight meters* for measuring light intensity. The maintenance man should have this instrument to provide proper and sufficient lighting for each job in the plant.

6. In addition, built-up equipment such as oscillators, vacuum tube voltmeters, vibration pick-up, and many other are available.

#### Applications

The maintenance man can and should use instruments wherever possible. There are innumerable opportunities. Some of the more frequent applications are given in the following list:

1. To determine loading of motors and generators. Especially useful in allocating loads to maintain operation at maximum efficiency.
2. To measure current in conductors in order to keep system cables and branch circuits from becoming overloaded, with subsequent loss of power through heat, and danger of fire.
3. To determine voltage applied to apparatus in order to operate at the most efficient point, especially in lighting and heating.
4. To record power, reactive power, power factor and frequency.
5. To determine insulation resistance and to prevent voltage breakdown and grounding.
6. To measure speed of moving apparatus such as motors and conveyor belts.
7. To measure temperature of ovens, furnaces, motor and generator windings and bearings.
8. To measure noise level of equipment.
9. To make test sets for production testing for such factors as resistance, power and capacity.

Instruments can show their worth in actual dollars saved, resulting from such tests. For, as is well known, motor efficiency varies with load, and that maximum efficiency is usually at full load.

For example:—If a 50 hp. squirrel cage induction motor is run at half load (25 hp.), the cost of operation will be greater by approximately \$56.16 per year than if a 25 hp. motor was used at full load.

Considering efficiency of  
 50 hp. motor at  $\frac{1}{2}$  load = 84 per cent  
 25 hp. motor at full load = 89 per cent  
 Power consumed—  
 Kw. of 50 hp. motor at  $\frac{1}{2}$  load = 22.2  
 Kw. of 25 hp. motor at full load = 21.3  
 Kw. difference = 0.9

At 3 cents per kw.-hr. for 8-hr. day, this difference amounts to 21.6 cents, or for one year (5-day week, 260 days and 8-hr. day) is \$56.16.

The above example does not take into consideration running light and other operating factors of the two motors.

#### Selection

Selection of the proper instrument is important and depends on the job. Some factors to be considered are:

1. Kind of power: a.c. or d.c.
2. Type of service: portable, switchboard, laboratory standard, or socket.
3. Quantity to be measured: amperes, volts, frequency, temperature.
4. Scale length: determined by accuracy, reading distance, small incremental changes.
5. Accuracy desired and under what conditions.
6. Range of instrument including external accessories available, such as shunts, multipliers, transformers.
7. Damping and responsiveness.
8. Shielding in proximity of strong field.
9. Temperature effect especially for potential measurements.
10. Cost.

Scales should be used so that readings in general will be between 10 and 90 per cent of full scale. Accuracy of instruments depends on the job to be done. It ranges from about 10 per cent down to one-tenth of one per cent, depending on the type and size of instrument. It is unreasonable to use a 0.5 per cent instrument to measure values which need not be held better than 5 or 10 per cent. On the other hand, a 2 per cent instrument is unsatisfactory to measure values that must be held to close limits.

#### Accessories

Some of the accessories or external units most commonly used are—

1. *Shunts*, which are required on d.c. circuits. The load capacity ranges up to several thousand amperes. They should be used with even ratios such as 10, 100, or 150 to 1. Specially calibrated cables must be used between the shunt and millivolt instrument for measuring current.

2. *Multipliers and resistors*, which are



**MAINTENANCE FACTS** are important for checking machine performance. Here portable instruments are used to test a motor driving an air pump. (General Electric Co. photo)

# ELECTRICAL MAINTENANCE GUIDE SHEET

## Instruments to use for measurements

Circuit	Use Figure	Line Amperes	Quantity to be Measured		
			Line Volts	Watts Power	Power Factor
Direct Current.....	1 or 2	A	V	W or $A \times V$	None
Single Phase A. C.....	3 or 4	A	V	W or $A \times V \times P. F.$	P. F. or $\frac{W}{V \times A}$
2 Ph — 3 W Balanced†....	Measure 1 phase as per Fig. 3 or 4			Watts $\times 2 = \text{total}$	Same as for single phase
2 Ph — 3 W Unbalanced‡..	5 or 6	A	V	$W_1 + W_2$	◆
3 Ph — 3 W Bal. or Unb...	5 or 6	A	V	$* W_1 \pm W_2$	P. F. or $\left( \frac{W_1 \pm W_2}{V \times A \times 1.732} \right)$
3 Ph — 4 W Balanced.....	Same as 3 Ph — 3 W			.....	Same as for 3 Ph — 3 W Bal.
3 Ph — 4 W Unbalanced...	9	A	V	$W_1 + W_2 + W_3$	◆
2 Ph — 4 W Balanced.....	Measure 1 phase as per Fig. 3 or 4			Watts $\times 2 = \text{total}$	Same as for single phase
2 Ph — 4 W Unbalanced...	7 or 8	A	V	$W_1 + W_2$	◆

### Letters designate instruments

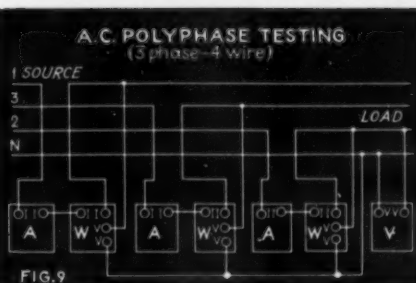
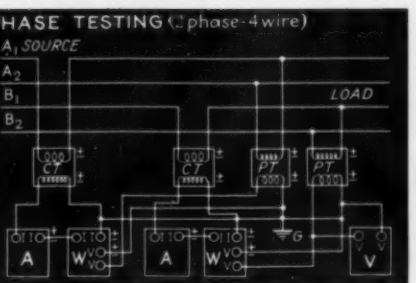
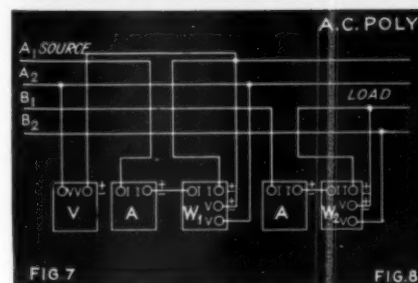
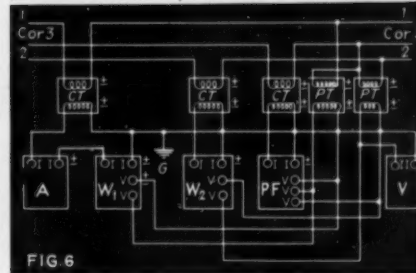
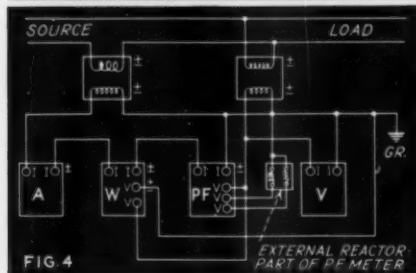
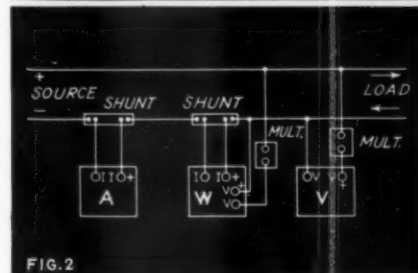
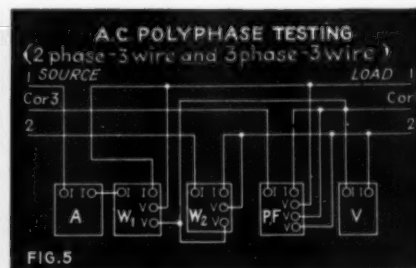
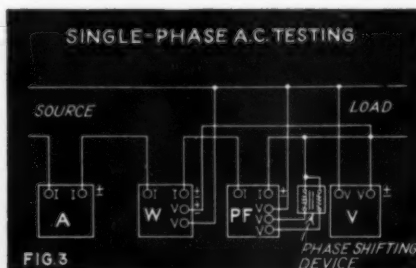
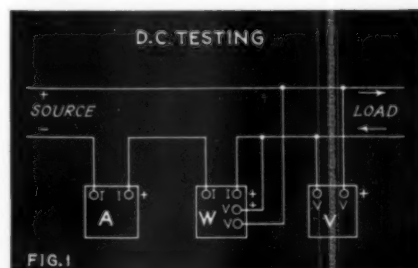
† Current element of wattmeter and ammeter can be placed in either line but not the common.

‡ The current in each line should be measured in unbalanced systems. The diagrams show only one ammeter connected for simplicity. All line and phase voltages should be measured for unbalanced systems. For simplicity one connection is shown.

◆ Power factor measurements of overall polyphase circuits cannot readily be made on unbalanced systems. Reference in table above has been omitted.

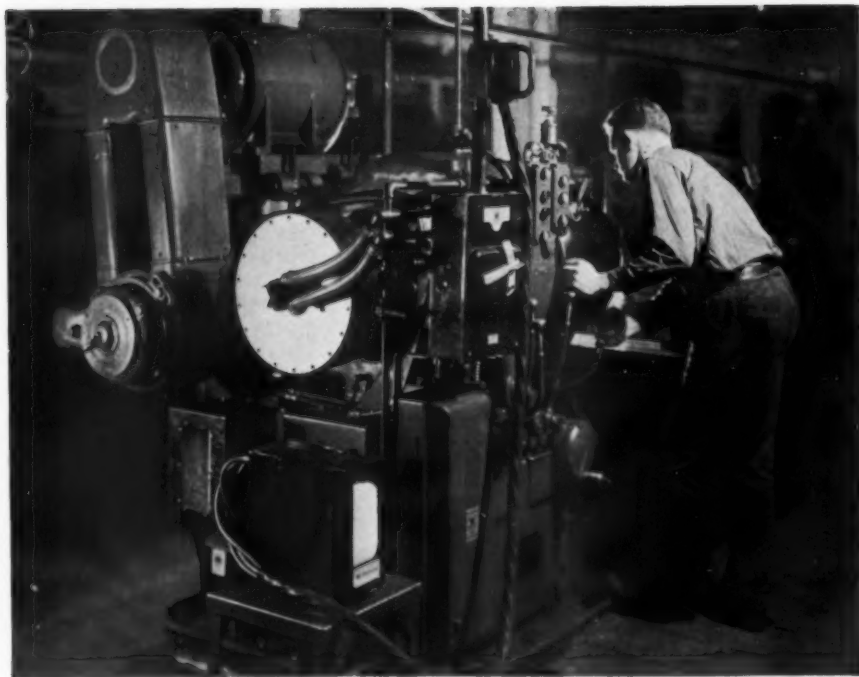
\* Two wattmeter method as shown will result in reversal of one wattmeter for power factor of less than 50 per cent. Reverse potential leads on this wattmeter to give up-scale deflections. Subtract watts from value given by other wattmeter.

### Connection Diagrams For Instruments



Note for Fig. 9—3 phase—4 wire with C.T. and P.T. not shown because there are many connections using combinations of Y-Y,  $\Delta$ - $\Delta$ , Y- $\Delta$ , etc.

**DESIGNATIONS** I—Current Terminals V—Potential Terminals A—Ammeter V—Voltmeter PT—Potential Transformer PF—Power Factor Meter G—Ground CT—Current Transformer W—Wattmeter In each case where two wattmeters are used, they can be replaced by a polyphase wattmeter which is essentially two instruments on a common shaft.



*RECORDED DATA is obtained at this lathe to check varying load conditions. A universal socket wired into circuits of important machine tools permits this recording wattmeter to be plugged in for periodic tests. (Westinghouse photo)*

used with a.c. and d.c. voltmeters, a.c. wattmeters and other instruments to permit measurement of high potentials not safely applicable to the instrument proper.

3. *Current transformers*, which are required on a.c. circuits and with ammeters and wattmeters for measuring currents that would be impractical to pass through the instruments. They should be used also on circuits over 750 volts. The secondary usually has a current capacity of 5 amp.

4. *Potential transformers*, which are required on a.c. circuits over 750 volts. They are used with voltmeters to measure high potentials not applicable to the instrument proper. The transformer secondary is usually 115 volts.

#### For Testing

Setting up for test and test procedure is important for good results. Some points to remember are given below.

1. Choose good location, free from vibration and dirt.
2. Place instruments as near as possible to apparatus to be tested, keeping in mind stray field effects and vibration effects.
3. Place instruments, if horizontal type, on flat solid surface such as table or large box. Avoid placing instruments on floor.
4. Make connections as short as possible. Avoid running leads in aisles.
5. Use insulated wire throughout and of sufficient size to carry current.
6. Be sure all joints and contacts are clean and firm. Often special fittings can be made to facilitate connections, such as fuse cartridges for current connections.
7. Place instruments as level as possible.
8. Make sure pointers are on zero with circuits open. (Does not apply to power

factor or frequency meters).

9. Make diagram of connections before actually proceeding to make connections.

10. Have another person check connections, if possible.

11. Provide circuit protection wherever possible.

12. Avoid cleaning scale glass just before test especially in dry or cold weather. Rubbing the glass with a cloth will generate static charge which attracts pointer and causes incorrect indication. If glass must be cleaned, be sure to "breathe" on it afterward to discharge static. This precaution applies more definitely to highly sensitive instruments.

13. When reading instrument, avoid parallax (error due to oblique viewing of pointer and scale). Mirrors on scale are provided for this purpose. Read indications so that image of pointer is in line with pointer and thus cannot be seen. For scales without mirror, place eye as much normal to the pointer as possible.

14. Take readings from scale direct and later apply multiplying constants of external units.

15. Record all readings as well as range, model, and serial number of instruments and external units.

#### Care

Instruments and meters are exceptionally sturdy for such delicate mechanisms. But they, and their accessories require special attention if they are to have economical use and long life. For example—

1. Observe care in handling in order to insure continuous service with the highest degree of accuracy.
2. Upon receipt of instrument make a record of all essential data. Instrument should be checked.
3. Store in places free from dust, oil, heat, moisture and excessive vibration.
4. When not in use, keep covered. If

provided with cases, keep in containers.

5. When left connected for test, keep covered. Eliminate possibility of being pulled off table.

6. Make periodic check of all ranges, including external accessories. Check scale calibration and all cardinal divisions. Make record of each check.

7. Repairs should not be undertaken unless done by skilled instrument men with proper tools.

8. When carrying instruments in automobiles, cars and trains, avoid placing on floor or wherever excessive vibration is present.

9. Always empty inkwell before moving a graphic instrument.

10. Put ink in inkwell carefully. Spilled ink on coils of instrument causes rapid deterioration of insulation.

11. Occasionally wash inkwell and pen with warm water or alcohol.

12. Use ink supplied by manufacturer of instrument.

13. Properly thread the chart through the instrument.

14. Keep charts dry, because they expand when damp.

15. Select a chart speed that will sufficiently spread out the record.

16. Avoid use of shunt leads on a d.c. ammeter or wattmeter other than those supplied for that specific instrument.

17. Be particularly careful when connecting a wattmeter. Only one connection scheme is usually correct.

18. Periodically have instruments and meters inspected, serviced and calibrated.

19. See that all external units or accessories are in place before starting to make connections.

20. When connecting two or more instruments to the same current transformer always connect their current coils in series. Make sure that current transformer has sufficient volt-ampere capacity.

21. *Safety first.* Stand on insulated substance. Use right hand only when making connections.

22. Be prepared to clear the circuit if necessary or see that it is amply protected by overload device.

23. See that connections are correct as to polarity, and proper phase in case of poly-phase instruments.

24. Keep current terminals shorted until current is known to be safe value.

25. Keep voltage terminals open-circuited until voltage is known to be a safe value.



*CLAMP-ON TESTING—Quick ampere-load tests are possible with split-core tongs built in combination with an ammeter. Cables need not be disconnected when there is slack for clamping on the tongs. (Columbia Elec. Mfg. Co. photo)*



## PACKAGED PERFORMANCE + OPERATOR & MAINTENANCE SAFETY + NEAT APPEARANCE

Concentric Knockouts on top  
Plenty of wiring space  
Safety shield over line terminals

Approved Type A Safety Switch

High Interrupting Capacity  
Quick make-and-break  
Interlocked cover  
Externally Operated

Fusible

Accessibility  
Provision for locking

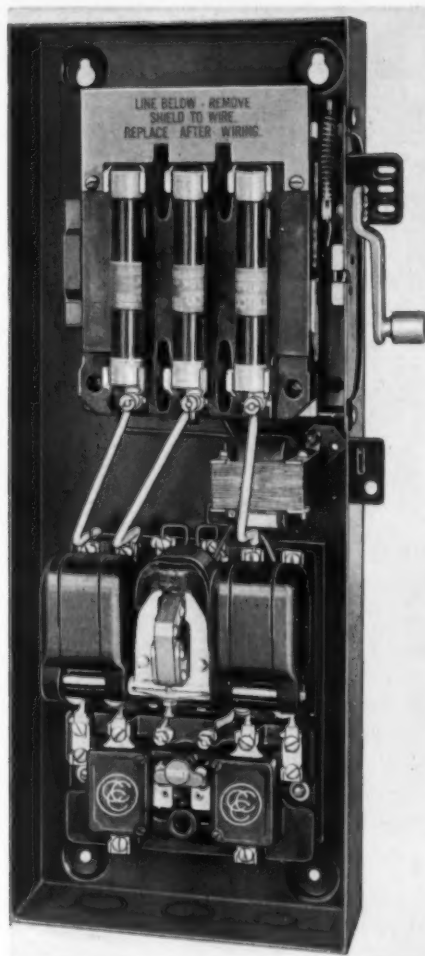
Pilot Circuit Transformer

Bulletin 7700 AC Contactor

Heavy Duty Hammerhead AC Magnet Construction  
Large Clearances  
Equally satisfactory for applications requiring frequent or infrequent operation

Bulletin 7322 Thermal Overload Relay

Heaters designed to meet Underwriters Laboratory requirements  
Enclosed thermal mechanism eliminates effect of stray air currents  
Reliable control contacts on resilient mountings unaffected by vibration  
Sufficient time delay on tripping to prevent unnecessary operation  
Large electrical clearances  
Easily accessible terminals  
Plenty of wiring space  
Concentric knockouts on bottom



OPEN VIEW

SPECIAL

BULLETIN 6018

TYPE TM A.C.

ACROSS-THE-LINE

STARTER.

THE "3C" Bulletin 6018 Type TM Combination Across-the-Line Starter for Squirrel Cage Motors, combines an externally operated Disconnect Switch with the Starter, plus a Pilot Transformer, all contained in one neat cabinet. This combination provides maximum safety for maintenance men, and utmost in safety to operators. Its appearance is greatly superior to that presented by separately mounted and conduit-connected Safety Switch and Starter. Pilot device maintenance is kept at a minimum, and there is marked economy in installation.

Starter features Dead Front construction. Starter cover can be opened only when the handle is in the "OFF" position. Switch cannot be thrown to the "ON" position until the cover is closed. Fuses are mounted directly above the blades in a position readily accessible for renewing. Fuses are dead when the Switch is in the "OFF" position. With the door open, the fuses

are dead, and are located some distance from the live parts, thus permitting inspection, repairing, or replacement of fuses with maximum safety. When the cabinet door is open, every part is electrically "dead." The "hot" line leads are covered by an insulating shield at the top. When the cabinet is open, it is impossible to contact "hot" lines without removing this shield.

Placing the Safety Switch and Starter with interlocked cover in a single housing makes it impossible to work on a starter without opening the Safety Switch, because the door will not open unless the Safety Switch is in the "OFF" position.

This device provides a transformer in the cabinet to step 440 volt input for use on main currents, down to 110 volts for use on the Pilot Devices.

Generous wiring areas, neat appearance, simple installation, low maintenance, maximum safety, and exceptional service under heavy duty are outstanding advantages of these Starters.

OFFICES IN PRINCIPAL CITIES



THE CLARK CONTROLLER CO.



1146 EAST 152<sup>ND</sup> ST.

CLEVELAND, OHIO



**CHEATHAM PLACE PROJECT, NASHVILLE, TENN.**  
97,470 feet of **ELECTRUNITE** Steeltubes in 1/2 and 3/4-inch sizes. Electrical Contractor: Edensfield-Newsome Electric Company, Nashville, Tennessee. General Contractor: Foster-Creighton Company, Nashville, Tennessee.



**LAUREL HOMES PROJECT, CHICAGO, ILL.**  
203,000 feet of **ELECTRUNITE** Steeltubes in sizes 1/2 to 2-inch, inclusive. Electrical Contractor: David G. and Company, Chicago, Illinois.



**JANE ADDAMS HOUSING PROJECT, CHICAGO, ILL.**  
347,300 feet of **ELECTRUNITE** Steeltubes in sizes 1/2 to 2-inch, inclusive. Electrical Contractor: Hossman Electric Company, Chicago, Illinois.



**JULIA C. LATHROP HOUSING PROJECT, CHICAGO, ILL.**  
656,000 feet of **ELECTRUNITE** Steeltubes in sizes 1/2 to 1 1/2-inch, inclusive. Electrical Contractor: Wadsworth Electric Company, Chicago, Illinois.

Photos courtesy United States Housing Authority

# IN THESE *Federal* HOUSING PROJECTS THE ELECTRICAL CONTRACTOR USES **STEELTUBES**

## FEDERAL HOUSING PROJECTS IN WHICH ELECTRICAL METALLIC TUBING IS USED

Atlanta, Georgia	"Techwood Housing"	\$3,000,000
Atlanta, Georgia	"University"	\$2,500,000
Birmingham, Alabama	"Smithfield Court"	\$2,500,000
Buffalo, N. Y.	"Kenfield"	\$5,000,000
Camden, N. J.	"Westfield Acres"	\$3,000,000
Charleston, S. C.	"Meeting Street Manor"	\$1,350,000
	"Cooper River Court"	
Chicago, Ill.	"Jane Addams Addition"	\$5,000,000
Chicago, Ill.	"Julia C. Lathrop Homes"	\$6,000,000
	(Diversey Housing Project)	
Cincinnati, Ohio	"Laurel Homes"	\$7,000,000
Detroit, Michigan	"Brewster"	\$5,500,000
Detroit, Michigan	"Parkside"	\$4,500,000
Evansville, Ind.	"Lincoln Gardens"	\$1,000,000
Jacksonville, Fla.	"Durkeeville"	\$1,000,000
Lackawanna, N. Y.	"Baker Homes"	
Lexington, Ky.	"Blue Grass Park"	\$1,750,000
Memphis, Tenn.	"Dixie Homes"	\$3,500,000
Memphis, Tenn.	"Lauderdale Court"	\$3,000,000
Minneapolis, Minn.	"Sumner Field Homes"	\$3,500,000
Nashville, Tenn.	"Andrew Jackson Court"	\$1,500,000
Nashville, Tenn.	"Cheatham Place"	\$2,000,000
Omaha, Neb.	"Logan Fontanelle Homes"	\$2,000,000
Philadelphia, Pa.	"Hill Creek"	\$2,225,000
Philadelphia, Pa.	"Juanita Park"	
Toledo, Ohio	"Brand Whitlock Homes"	\$2,000,000

**REC**



**HORN PROJECT, CINCINNATI, OHIO**  
of ELECTRUNITE Steeltubes in sizes 1/2 to 1", inclusive.  
Construction Co., Cleveland, O. Gen. Con-  
struction Co., Cincinnati, O.



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## MIKE'S MAINTENANCE MANUAL

By J. M. Zimmerman

Service Division,  
Westinghouse Electric & Manufacturing  
Company, Chicago, Ill.



### Prevent the Arc— And Never Be in the Dark!

**A**N arc or a flash-over is usually caused by an accumulation of dirt on an insulated surface. Dirt at first allows a very small amount of current to flow on the surface of the insulation. Eventually a flood of elec-

trical energy breaks loose in the form of an arc. Here are nine pointers on cleaning electrical apparatus which should be kept in mind if arcing is to be prevented:

1. Clean insulating surface of commutator mica V-ring.
2. Clean insulating surface of collector-ring assembly.
3. Wipe brushholder insulator.
4. Air-clean insulation barriers between contactor and armature.
5. Wipe surface of contactor panels.
6. Clean insulating parts in safety switches.
7. Air-clean motor windings.
8. Polish all knife switch blades and fuse clips.
9. Remove all brushes from their holders to make sure they are free and allow any particles between the brush and the holder to fall out.

### A Gear-motor Does It!

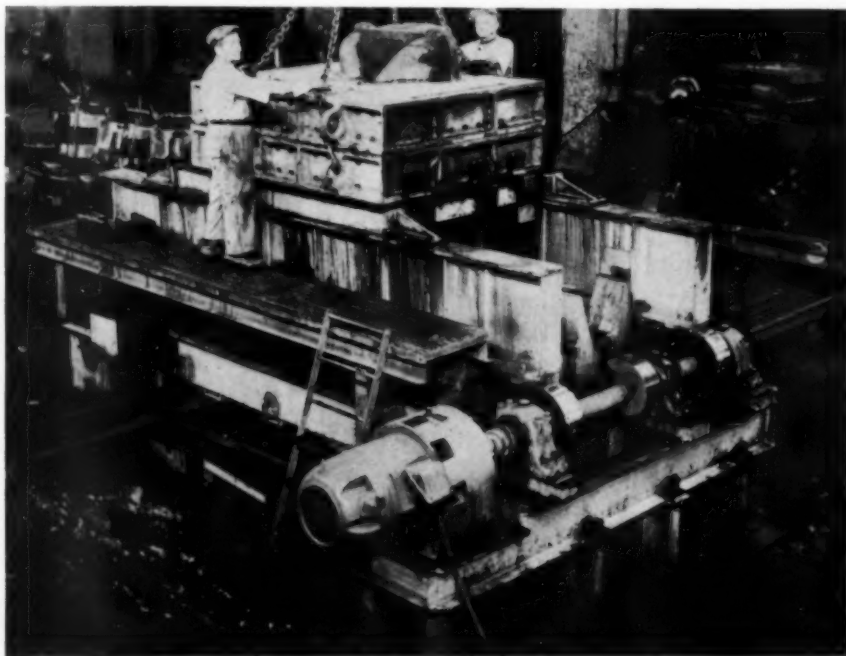
By raising and dropping this 20,000-lb. mold 83 times each minute, sand is separated speedily and economically from the castings. This method is accomplished by a new machine in the Everett steel foundry of the General Electric Co., Lynn, Mass.

The sand is shaken out and drops through a grating. Previously large molds were picked up by a crane, and

the castings were laboriously dug out.

This new machine is of all-welded construction, and is powered by a 20-hp. gear-motor which rotates a heavy shaft. Three cams on the shaft lift and drop one end of the shake-out beams. The beams are made from 24-in. "I" sections with 1x8-in. plates welded to both flanges and web stiffeners every two feet.

A 6,000-lb. steel casting absorbs the blow of the falling load. The entire machine is mounted in heavy structural steel frames which rest on a large concrete slab foundation.



GEAR MOTOR drives this automatic "shake-up" machine. A 20,000-lb. mold is raised and dropped 83 times each minute, to shake sand from castings

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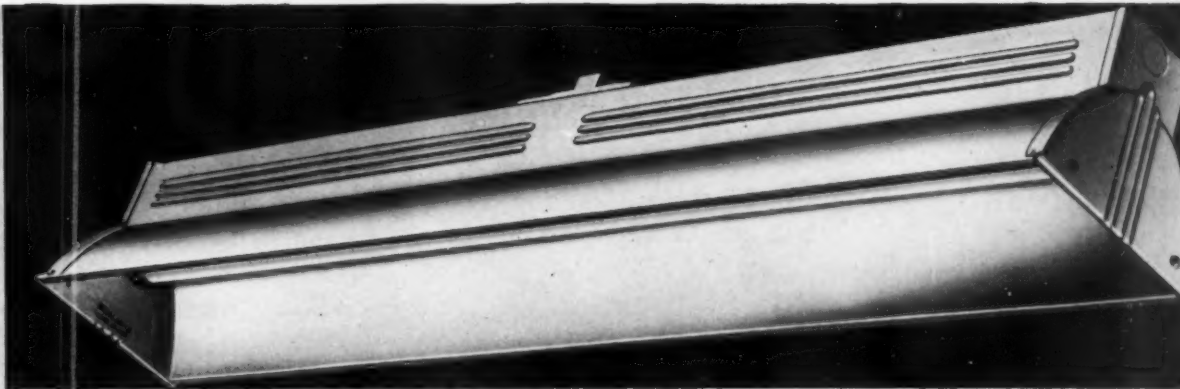
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The new Benjamin Flur-O-Line units enable you to secure best results from the new Fluorescent Mazda Lamps which provide the closest approach to natural daylight at the highest efficiency ever secured from such a light source.

With these new sectional type units, Fluorescent lighting may be fitted to the exact requirements of the work area. In the Flur-O-Line system, the units may be hooked up end to end to form a *long continuous line of light* or two to six units may

be connected side by side to form a wide light source.

Flur-O-Line reflector hoods consist of a highly efficient Alzak-finished aluminum reflector with which is combined a wiring channel and the necessary accessories, such as pipe fittings, chain suspension hooks, end to end couplings, etc., to provide easy and safe installation. Units are available in three lengths for the 18", 24" and 36" fluorescent lamps. For a Bulletin giving complete information, mail coupon.

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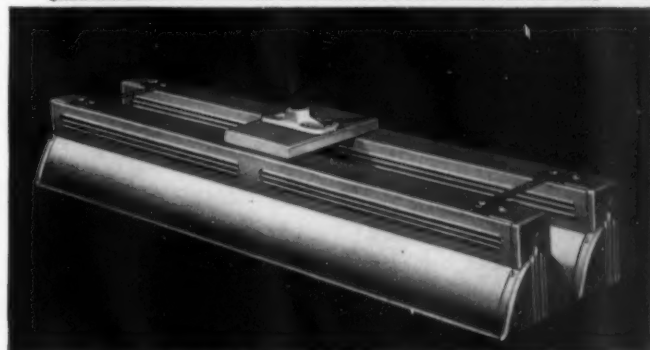
Benjamin Lighting Units for the Mazda Fluorescent Lamp are certified to comply with the requirements of Underwriters' Laboratories as evidenced by the Underwriters' Laboratories Inspection Label affixed to the unit. They are warranted by Benjamin to have a *light output efficiency of 78% or more* and to comply with all recognized safety requirements, illumination, electrical and mechanical standards.

Auxiliaries supplied with these units are certified to be of the type made in accordance with specifications of Mazda Lamp manufacturers. Units supplied without auxiliaries are designed for use only with such certified auxiliaries.

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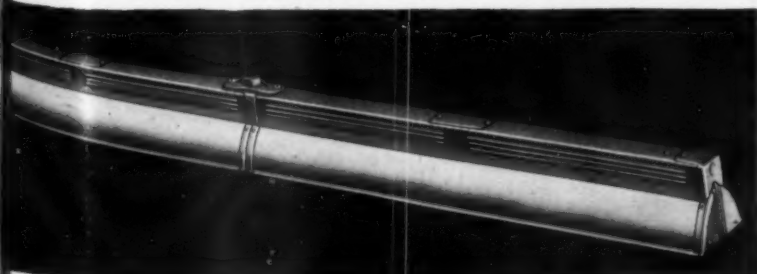
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B-M Connectors and Couplings help contractors to make more money because they eliminate complicated installations and save valuable time—this is a really simple method. Two squeezes on the handles of the B-M Indenter and the installation is completed. Our tools and method are patented and we limit the license of our tools to the installation of our fittings only. See your wholesaler for more about this simple method or write our distributors.



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## Trouble-Free Burglar Alarm Systems—25 Maintenance Suggestions

As a rule, most burglar-alarm systems are simple, and with a little care most trouble may be practically eliminated. The following outline covers the most frequent troubles in closed and open-circuit systems:

### Closed-circuit Systems

#### A—Audible signals fail to operate.

1. Check for weak battery, blown fuses, or defective transformer. (If relay has operated, follow 2, 3, 4, 5.)
2. Check relay for defective contacts on contact springs, or loose connections leading from the relay contacts to the audible signal.
3. If constant-ring drop is used in conjunction with a closed-circuit relay, check its coils and contact springs leading to audible signal.
4. Adjust audible signal.
5. Check for loose connection at audible signal. (If relay has not operated, follow 6, 7, 8, 9.)
6. Check relay at pivot end of armature for "freeze," and check armature at core of magnet to see if sticking is caused by magnetism or by insulating paint or varnish.
7. Check to see if short circuit in door and window spring circuit prevents contact springs from opening circuit.
8. Examine tamper spring circuit in both audible signal housing and control cabinet for short circuits.
9. Check burglar-alarm lock switch to see that it is on open-circuit.

#### B—Audible signal operates continuously.

10. Check for weak battery, blown fuses, or defective transformer.
11. Check for open-circuit in door and window contact spring or window foil circuit. Examine contacts for positive connections.
12. Check relay for loose connection to its coil.
13. Check resetting device on locking type relay to see that audible signal contact springs are separated.
14. Check for crossed wire at relay contacts.

### Open-circuit Systems

#### C—Audible signals fail to operate.

15. Check for weak battery, blown fuses, or defective transformer. (If constant-ring drop or relay has operated, follow 16, 17, 18.)



16. Check constant-ring drop or relay for defective contacts on contact springs, or loose connections leading from these contacts to audible signal.
17. Adjust audible signal.
18. Check for loose connection at audible signal.  
(If constant-ring drop or relay has not operated, follow 19, 20, 21, 22.)
19. Check constant-ring drop or relay at armature for "freeze" and check at core of magnet to see if sticking is caused by magnetism or by insulating paint or varnish.
20. Check connection to coils of constant-ring drop, also check for open in coil.
21. Examine and check for open-circuit in door and window spring contact circuit, which would prevent these springs from closing the circuit. Generally this trouble may be traced directly to a certain door or window, as this is a multiple circuit.
22. Check burglar alarm lock-switch to see that it is on closed circuit.

*D—Audible signal operates continuously.*

23. Check for crossed wires or short-circuit in door and window spring contact units and wiring.
24. Check resetting device on the constant-ring drop or relay to see that audible signal contact springs are separated.
25. Examine wiring around constant-ring drop and relay contacts to see that there are no short-circuits.

## Rectifiers Solve Power Supply Problem

Mercury-arc rectifiers recently solved a problem in Baltimore for the Baltimore and Ohio Railroad. A synchronous converter substation had to be moved to make way for a street extension. This substation supplies direct current to locomotives pulling trains up the electrified 3.7-mile Belt Line into Baltimore, which includes the 1.4-mile Howard Street Tunnel.

Railroad-owned space was available a few feet from the old substation, but it was directly over the tunnel itself. It was felt that the tunnel walls were not strong enough to stand the vibration of the old rotating conversion equipment. To move the substation to other sites some distance away would involve considerable expense in rearranging a.c. and d.c. feeder cables, the purchase of another synchronous converter for use during the transition period, and the purchase of the necessary land.

The use of rectifiers overcame all



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THE ONLY ELECTRIC  
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Introduced by Yale just a short time ago, the Cable King with its AIR-COOLING feature is already skyrocketing its way to leadership in the electric hoist field. NOW everybody wants AIR-COOLING!

The reason is simple. AIR-COOLING saves the operator money. The basic limiting factor in electric hoist construction has always been excess brake heat. When Yale engineers adapted the special sirocco blower action that would cool the brake frictional parts they, for the first time, made it possible to eliminate this heat.

That's the principle of AIR-

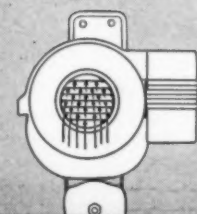
COOLING—a principle that permits the Cable King to operate on a heavier duty cycle than any other hoist in the same class. And that means greater economy than any other hoist in the same class!

In addition, the precision construction of the Cable King makes it the closest approach to perfect engineering specifications that has ever been built. AIR-COOLING plus mechanical perfection—that's what you get in the Cable King. It's the very latest advance in hoisting equipment.

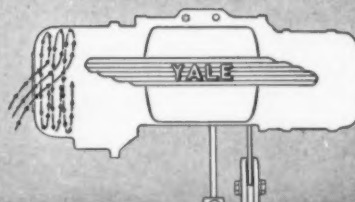
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The Greatest Economy Factor Ever Developed in Electric Hoist Construction.



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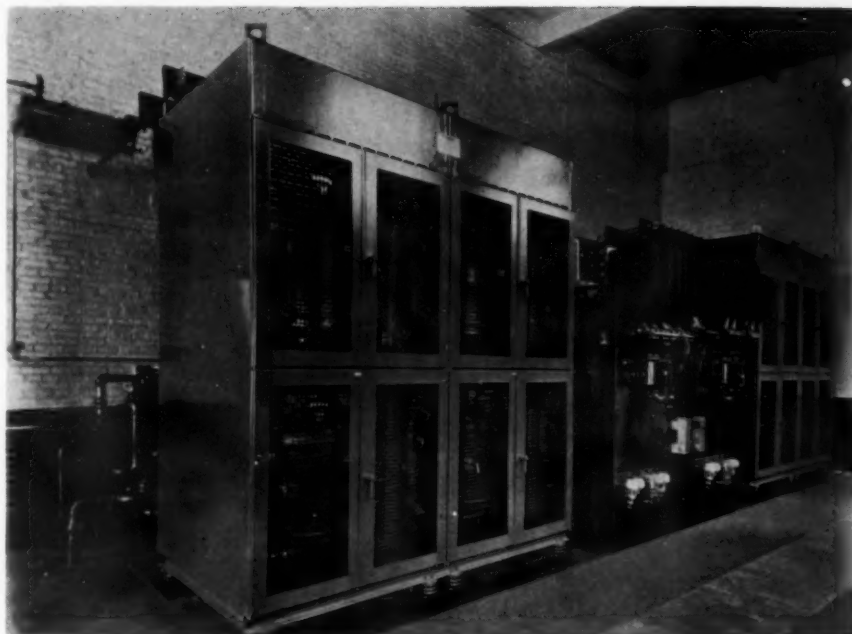
**Reduces Installation Time For  
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**AND TRAFFIC ROLLS**—The two 3,000 kw. sectionalized rectifiers supply d.c. power for the electrified 73-mile Belt Line of the Baltimore and Ohio Railroad in Baltimore. (Westinghouse Photo).

these difficulties. Because foundation requirements for rectifiers are much less than for rotating machinery, they could safely be placed in a new building directly over the tunnel. Cable rearrangements were held to a minimum, and service could be maintained by the old station until the rectifiers were ready for the load. Then the 28-year old converters were retired. As a consequence, a new, much smaller, and less expensive building was built, and two rectifiers were installed and placed in regular service.

The most important requirement of the substation was to supply 670 volts direct current to the tunnel feeders with absolutely no interruption. It is imperative that no train be stalled in the tunnel. To meet this high demand, two four-section rectifiers were chosen. The rectifiers are each rated at 3,000 kw. continuous, with 150 per cent load capacity for two hours, or 300 per cent load for five minutes. Supplying each rectifying unit is a water-cooled, three-phase rectifier transformer.

Space required for the rectifier substation is 9.8 cu.ft. per kw. capacity. The floor space required per kilowatt for the rectifiers is only 37.5 per cent of that used by the converter plant.

The rectifiers show an appreciable saving in power over the converter station. Because there are frequent and long periods when no eastbound, up-grade trains are in the tunnel, the rectifiers frequently are entirely unloaded—followed, perhaps instantly, by a heavy overload.

Since the rectifiers have been in service, they have carried the Belt Line load successfully and without a single

instance of backfire. The rectifier equipment is being operated by the same personnel that operated the old rotating conversion station. Only a short period of instruction was necessary for the men to learn the technique of operating the new and very different equipment.

### Vibrating Bells in Series

**Q.** Two six inch vibrating type bells with contacts are used in a system to assure a foreman that the signal has reached a remote point, and that the signal is the same as transmitted from a central point. Some trouble has been experienced at various times due to improper signals and this must be corrected. The present system is operated from a twelve volt storage battery. Alternating current is available at the central point. What can be recommended to correct this trouble?—F. D.

**A.** The best method would be to replace the present bells with non-contact or polarized bells, and use a transformer as a source of current. This will give the best service and the present wiring may be used.

The second method is to disconnect the vibrating contacts on one of the present bells, and only allow the current to pass through the electromagnets. In this way the bell will be changed to a single stroke bell. After making the change, the other vibrating bell will "make" and "break" the circuit rapidly for the converted bell, and both bells will therefore operate in unison when the push button is pressed.





***"Don't worry about his ear. He says that cabinet is shinier than your shaving mirror!"***

Maybe you won't care to use the Allen-Bradley solenoid starter's glossy black cabinet as a shaving mirror, but you will like its attractive appearance. And this good looking cabinet encloses a simple and rugged solenoid starting switch which will give you millions of trouble-free operations.

You never have to clean or file the double break, cadmium silver alloy contacts on this starter. Thus, valuable contact metal is not wasted and contact life is prolonged. Also it is easy to install the Allen-Bradley solenoid starter. It has generous wiring space, white interiors, accessible terminals, and many knockouts. Here is a starter designed for your toughest jobs. It will pay you to specify Allen-Bradley control.



Bulletin 709 across-the-line starters for squirrel cage motors. Maximum rating: 30 hp, 220 v; 50 hp, 440-550 v.



# ALLEN-BRADLEY

## SOLENOID MOTOR CONTROL

QUALITY





## "TROUBLE?" -Not with Allen-Bradley Control"

"I always thought motor starters were the 'weak links' on our machines. But since we installed those Allen-Bradley solenoid starters, I've changed my ideas a lot. These starters are in almost continuous operation, yet they never give us any trouble. Believe me, when we need more starters, I'm going to be sure they're Allen-Bradley!"

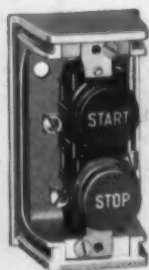
### A NEW Push-Button Station

#### New in Styling

Note the clean, modern appearance of this new Bulletin 800 push-button station. With its glossy black, heavy bakelite cover and sturdy die cast frame, it is the ideal "start-stop" station for any general purpose application.



#### New in Ideas



The silver-to-silver contacts are located where dust and dirt must do tricks to get at them. Yet the terminals could not be more accessible. Removing the cover completely exposes the push-button unit, making the wiring of the button a "cinch." Ask your Allen-Bradley representative to show you this new A-B push-button station.

### THE MOTOR STARTER THAT'S TROUBLE-FREE

#### Simple Construction

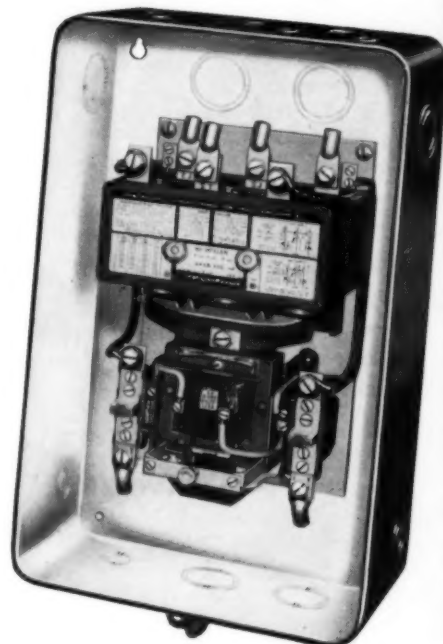
No bearings, no pivots, no complicated mechanisms—that's the secret of the Allen-Bradley solenoid starter's long and trouble-free performance.

#### No Contact Maintenance

You never have to file the double break, cadmium silver alloy contacts. That's one reason why they last many times as long as ordinary contacts.

#### No Unnecessary Shutdowns

Because of the efficient solenoid action and straight-line motion, welded contacts and shutdowns caused by poor line voltage conditions are avoided.



Bulletin 709, Size 2, across-the-line solenoid starter for squirrel cage induction motors.

#### Rugged Parts

This simple starter has few parts. They are extremely rugged and will withstand abuse.

#### Overload Protection

Two eutectic solder overload relays protect the motor from sustained overloads. They are reset by pressing a small button on the cabinet front.

Send for "The Story of the Solenoid Starter"

Allen-Bradley Company  
1307 S. First Street  
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# ALLEN-BRADLEY

## SOLENOID MOTOR CONTROL

QUALITY

## Selling Light To The Machine Shop

[FROM PAGE 17]

small equipment, used intermittently, should be provided with high intensity local lighting units. These may be secured directly to the machine by adjustable arms. Many specially designed lighting units combined with glass eye-shields are available for use with grinders. There are also a variety of highly efficient local projectors designed for use with small lathes, drills and other metal working machinery.

### Work Benches

In the accompanying drawing, benches in the shop area have supplementary lighting from drop cords to provide 50 foot candles of additional intensity. These units are mounted 30 in. above the bench, spaced on four to five foot centers, and equipped with deep bowl reflectors.

In applying these recommendations to the different machine shops, however, other types of lighting units may be found more satisfactory for certain

WHAT TO INSTALL			
Recommended intensities and lighting units for the machine shop			
LOCATION	FOOT CANDLES	TYPE OF UNIT	LAMP
General Shop .....	25	RLM Dome RLM Dome & Cover Low Brightness	B-300 watt B-250 watt HIMV E-200 watt
Layout Bench .....	50+	Daylight glass cover Deep bowl	G-200 watt
Work Benches .....	50+	Industrial spotlight	C-200 watt
Lathes, Milling machines..	75+	Local reflectors	D-60 watt
Bench lathes, drills.....	75+	Canopy reflectors	F-100 watts per ft.
Assembly benches .....	100	Semi Indirect	A-300 watt
Office .....	20	Low Brightness	E-400 watt
Drafting board .....	100		

ing the lamps suspended below the reflector. The reflectors are placed end to end in a continuous unit extending the full length of the assembly bench. They are suspended approximately 4 ft. above to provide upward of 100 foot candles of illumination.

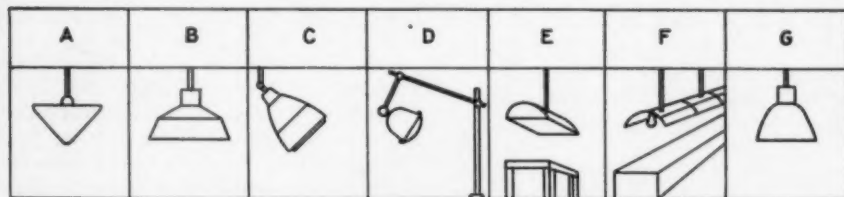
### Tool Room

Tool room work in the machine shop calls for precision and must have exact seeing. For in addition to stocking small parts and tools, the tool man re-

able for indirect lighting, the glass steel diffuser will probably be the most suitable type of unit. In applying such lighting units to office work, it is often desirable to use units one or two sizes larger than the lamp rating, to reduce the brightness of the enclosing globe. For instance, in the installation shown, the 300 watt lamp normally enclosed in a 20 in. unit would provide a much lower surface brightness on the glass if enclosed in a 24 in. unit. If a finished ceiling of light color suitable for indirect illumination is present, any well designed indirect or semi-indirect lighting unit will provide effective and attractive illumination.

For the drafting board use the same type of large area low brightness lighting unit recommended for the layout benches. This will give high quality glareless illumination on the paper or tracing cloth. As there is considerably less reflected light from these materials than from metal, higher intensities can be conveniently used. One such unit with two 200 watt lamps or the equivalent of 400 watts, will provide good illumination over a 3x6 foot drafting board.

The application of these recommendations to machine shops in your community will provide an effective lighting system. Each job, however, will require individual treatment in layout and lighting unit location. The methods shown in the diagram can be applied by readapting them to meet the conditions encountered in the individual shop.



PICTORIAL INDEX to table on Page 17

types of bench work. For instance, highly polished sheets would require lighting units with low brightness surfaces. Plated materials could be handled more effectively under reflectors equipped with daylight lenses. But the layout shown, provides a good standard for bench work in the average shop.

### Assembly

For floor assembly of machine tools and the handling of other products of the shop, the general lighting system usually provides adequate illumination. Where small parts are assembled and some finishing operations are performed at benches on a production basis, however, high intensities of evenly distributed illumination are required.

In the drawing, a sub-assembly bench and a final assembly bench for small parts are shown. They are equipped with a production line lighting unit which provides a large area reflecting surface under closely spaced silvered bowl lamps. This type of unit is also available with a lighting trough enclos-

pairs and sharpens tools and shop equipment at the tool crib.

At the storage shelving, stock room lighting units provide even distribution over the vertical surface of the shelves and prevent direct lamp glare along the aisles. A minimum of 20 foot candles of general illumination is needed in the repair area, combined with well designed local lighting at the bench and grinding wheels. Where tools are passed over the counter to the mechanics, additional light for checking scribed tool sizes and other marks can be provided from mercury light sources or incandescent units with daylight lenses.

### Office

The office lighting, shown on the accompanying diagram, is provided by 300 watt semi-indirect lighting unit. But in applying these recommendations to the machine shop office it will be necessary to take into consideration the character of the ceiling and walls and the type of work performed.

If the ceiling is unfinished and unsuit-

*This is Number Six in a series of articles recommending layout, intensities and types of units for lighting different kinds of occupancies. Others appeared in the issues of January, March, May, July and September 1938.*



# In the News

## NECA OPPOSES BARE NEUTRAL

The Executive Committee of NECA meeting in New York City, February 6 to 8, voted as opposed to the use of bare (uninsulated) neutral conductors, for the following reasons:

1. It is obvious that this proposed change in the National Electrical Code standards has been submitted in the interest of cheaper wiring. A careful analysis and comparison of costs disproves the theory that the use of bare neutral conductors would lower the overall cost of wiring.
2. Bare neutral wires would invite corrosion which in turn would attack insulated conductors causing complete breakdown of circuit.
3. The use of bare neutral wires would prevent the transposing of conductors in conduit, frequently necessitated by the breaking down of insulation on hot wire. With the present fully insulated system, when it is impossible to pull out and replace a grounded conductor, the circuit can be restored by transposing the neutral conductor to replace the defective conductor at a great saving in cost to the owner.
4. A bare neutral conductor, in case of reversed polarity and inadequate circuit protection, makes all metal parts of system, fixtures and equipment alive.
5. The introduction of a bare conductor in any wiring metal system will in our opinion add to the fire and casualty hazards in constantly increasing proportion under average use over a period of time.
6. We are unalterably opposed to lowering the standards of N.E.C. requirements when the only reasons put forth are solely commercial.
7. It is our solemn duty to safeguard the public in every way possible, and we should vigorously resist any attempt to expose the public to hazards such as this radical change and lowering of standards would incur.

## MINNESOTA CONTRACTORS AND INSPECTORS MEET JOINTLY

Minnesota electrical contractors held their annual joint meeting in Mankato, Feb. 16 to 18. Members of the Minnesota Electrical Council, the Minnesota Electrical

Association and the North Central Associated Electrical Industries were there. Attendance passed 350, with representatives from all over Minnesota and from the Dakotas.

The program combined business meetings of the several associations with joint meetings where industry problems were aired. Top speakers were Earl Whitehorne, editor of *Electrical Contracting*, at the all industry luncheon on Friday, and Gerald Stedman, merchandising counsel, at Saturday's banquet. Mr. Whitehorne talked on present opportunities before the contractor and what to do about it. Mr. Stedman's topic was "What Makes a Man Successful." The program also presented D. M. Wakefield on "Legal Angles of Electrical Contracting," W. C. Stephenson of the Modern Kitchen Bureau on ranges, water heaters and roasters, A. B. Smedley of Anaconda Wire and Cable Co. on adequate wiring, D. W. Prideaux of Nela Park on fluorescent lighting. General discussions focussed strongly on rural wiring problems.

"Golden Jubilee certificates" in recognition of fifty years of service in the electrical industry, were presented to W. S. Manthey, Owatonna; J. W. Peterson, Fergus Falls; Leonard Peterson, Crookston; E. G. Howard, Minneapolis. New officers elected were—Minnesota Electrical Council, Wm. S. Johnson, Duluth, president;

E. N. Karst, Fergus Falls, vice-president; F. M. Tripp, treasurer; William A. Ritt, secretary-manager. Minnesota Electrical Association, E. N. Karst, Fergus Falls, president, E. M. Raetz, Rochester, vice-president; William A. Ritt, St. Peter, secretary-treasurer.

## WISCONSIN CONTRACTORS IN MILWAUKEE

A two-day program filled with valuable talks, demonstrations and discussions of vital interest attracted 178 electrical contractors, and other electrical men to Milwaukee, February 17 and 18 for the annual meeting of the Wisconsin Electrical Association. The program was outstanding.

L. A. Jackman speaking for the Industrial Commission of Wisconsin, told about the new electrical fence regulations with which all old and new fences in Wisconsin must comply.

Three speakers on inter-industry cooperation followed—L. A. Falk, Wisconsin Power & Light Company, W. A. Haid, Chief Inspector of Milwaukee and E. J. Brown, Electrical Workers Local No. 494.

Apprenticeship training was discussed by W. F. Simon, supervisor of apprenticeship for the Industrial Commission of Wisconsin, who advocated planned, comprehensive apprentice training in the electrical contracting industry. The complexities of overhead analysis and how it is computed was outlined by R. R. Knoerr, electrical contractor of Milwaukee. L. W. Davis of the National Electrical Contractors Association of New York talked on national legislation.

Technical problems of the industry were covered by A. B. Smedley of the Anaconda Wire & Cable Company, who discussed the effects and causes of voltage drop with the aid of elaborate demonstration equipment.

W. E. Hennig of Milwaukee described electrical test methods and showed the testing instruments available to the contractor for industrial analysis work.

I. L. Illing and A. A. Englehard of the Wisconsin Electric Power Company staged



**SHOPPER EDUCATION**—This electrical safety exhibit occupying a 20-ft. display window of Namm's Department Store in Brooklyn, N. Y., is the latest educational stunt of the New York Chapter IAEI. Located in the heart of Brooklyn's department store area with three or four other leading stores close by, this display attracted considerable attention from the steady stream of shoppers during a ten-day period. Old wiring methods dating back to 1885, and hazardous makeshifts, were shown beside modern methods. Specimen certificates of inspection were shown, together with warnings to have only licensed electricians install wiring.



Here's

# OPPORTUNITY!



## There's REAL MONEY in selling these popular Interior Telephone Systems

Business is communication conscious—awake to the time-, step- and money saving advantages of fast, direct interior telephone facilities. This is proved by the constantly increasing demand for the private systems offered by Automatic Electric Company.

This spells OPPORTUNITY for you—a chance to profit by selling Automatic Electric private telephone systems to offices, shops, factories and homes.

Not only does this "plus" business boost your income but the consistently efficient performance turned out by these modern systems—day and night, year after year—earns for you the genuine appreciation and confidence of your customers.

Automatic Electric, originators of the automatic telephone, has been making both public and private systems for over forty years. Shown here are four of the many types of private systems available. Our field representative will be pleased to supply you with literature, prices and discounts as well as to work with you on particular jobs. Talk to him.

**INTERCOMS** (upper left) Common-talking, selective-ringing systems in capacities of two to eleven stations. Beautifully designed, and durably constructed for long, faithful service. Operate from dry cells or battery eliminators.

**AUTO-COMS** (upper right) Deluxe intercom. systems, providing selective talking and selective signaling service for a maximum of ten stations, and up to five connections at one time. No automatic switchboard needed.

**SERV-U-FONES** Attractively priced common-talking systems in capacities of two to ten stations. Conveniently packaged, simple to install. Dry cell operated.

**P-A-X'S** Private Automatic Exchange systems, available in all capacities. Use standard automatic telephones and provide for a variety of special communication services.

♦ Automatic Electric Intercommunicating Systems are designed for private service. They cannot be connected with the public telephone system. ♦

# AUTOMATIC ELECTRIC

## PRIVATE INTERIOR TELEPHONE SYSTEMS

Distributed by: AMERICAN AUTOMATIC ELECTRIC SALES COMPANY, 1033 West Van Buren Street, Chicago, Illinois

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[FROM PAGE 54]

an elaborate demonstration of lighting display equipment.

The Electric League of Milwaukee annual dinner dance occurred on the evening of the second day of the convention and delegates attended. The entire slate of 1938 officers of the Wisconsin Electrical Association were re-elected for 1939, Roy W. Springer, Superior, president; R. J. Nickles, Madison, vice-president; William Merkle, Marshfield, treasurer; E. H. Herzberg, Milwaukee, executive secretary.

### GREEN BAY OFFICERS

L. P. LaHaye was elected president of the Green Bay (Wis.) Electrical Contractors' Association at its recent annual meeting. Other officers are A. J. Verheyden, vice-president; A. A. Allen, secretary-treasurer, and A. F. Vanderheyden, sergeant-at-arms. The association voted to approve and sponsor an electrical safety show to be presented by the Green Bay Electrical League in March.

### GOOD PROSPECTS FOR MILWAUKEE

Sales predictions for 1939 assume favorable proportions in the Milwaukee area. This was revealed at the second annual

sales conference sponsored by the Wisconsin Electric Power Co., the Electrical League of Milwaukee, the Wisconsin Radio, Refrigeration and Appliance Association and the Electrical Contractors' Association, held Jan. 25 at the Public Service Bldg. in Milwaukee.

Predictions were that 22,000 "better sight" lamps, 25,000 roasters and casseroles, 11,200 electric refrigerators, 3,000 electric ranges and 1,500 electric water heaters would be sold there in 1939.

### NECA APPOINTMENTS

The following men have been appointed to serve on joint industry committees:

W. Edward Frazer, of H. B. Frazer & Company, Philadelphia, to serve on the Preliminary Planning Committee in connection with the Industrial Electrification Program sponsored by NEMA. A professional advertising and research agency has been employed to assist this committee in preparing a survey of the industrial field and in the development of a practical approach to the market.

C. M. Munoz, of Harry Alexander, Inc., New York City, to serve on the Joint Industry Committee sponsored by NEMA to study the problem of adequate commercial wiring. The purpose of this committee is to push promotion of adequate wiring of commercial and office buildings, government buildings, warehouses, stores and other similar buildings, using as a basis for their program the standards for commercial wiring already set up in the Handbook of Interior Wiring Design.

N. P. Hoisington, of W. C. Pangborne &



**SAN FRANCISCO OFFICERS**—Carl C. Severin, pioneer electrical contractor of San Francisco, has been elected president of the San Francisco Electrical Contractors Assn., Inc. He was unopposed for the office, having been responsible in a large measure for bringing into the Association the large group of contractors formerly organized as the Master Electricians Assn. George W. Abbett, also an officer of the Master Electricians group, was re-elected vice-president of the San Francisco Association. Secretary Edward Martin, Sterling Electric Co., and George Smith, treasurer, were likewise re-elected unanimously.

Company, Philadelphia, to serve on the National Electrical Safety Code Committee under the sponsorship of the Bureau of Standards, Department of Commerce. This committee is responsible for the development of safety rules for the installation and maintenance of electrical supply and communication lines, similar to the responsibility of the Electrical Committee, N.F.P.A., for the development of the National Electrical Code.

### MORE CITIES DEVELOP A-W ACTIVITIES


With the promotion and certification of adequate wiring well under way over the country, various new local activities are developing. Here are recent examples that are focussing attention upon this subject: **Houston, Tex.**—The entire sales department of the Houston Lighting & Power Company plans to aggressively promote adequate wiring this year. Forty home service advisors will call on all residential customers with specific zones to work in. They will be responsible for new residential construction in their districts. Two home planning counsellors will contact architects and speculative builders.

**Pittsburgh, Pa.**—A dramatic and colorful, animated display on adequate wiring has been developed by the West Penn Power Company, which shows the Inadequate-Adequate cycle of residential wiring. As a direct result of a window display on adequate wiring, sponsored by the Electric League of Pittsburgh for a ten-day period during January, the League received fifteen inquiries on wiring and developed five sets of wiring plans on request.



"Gosh, in the apprentice school everything seemed so darned simple!"





*Marching along  
together*

# STEEL.. STYLE.... COMFORT



Sheets - Plates - Pipe and Tubular  
Products - Conduit - Tin Plate - Bars  
Rods - Wire - Nails - Unions - Tie  
Plates and Spikes

25-11B

## YOUNGSTOWN

Except for steel, the shoes we wear would be little better than medieval sandals, with their shapeless ugliness and destruction of foot health.

The arch which assures comfort, safety, lasting appearance, is made by a steel brace concealed in the leather. Heels are possible because of steel nails. Steel eyelets keep the laces from tearing the leather. The laces thread easily because of steel tips--to say nothing of the steel machinery vital to processing the leather and making the shoes themselves.

It takes almost 100 pieces of steel to make most pairs of modern shoes, and they are only a small fraction of the thousands and thousands of pieces of steel you use every day to make life comfortable and safe. Steel makes possible your electric light, home heating plant, canned food delicacies, automobile, office building and factory, railroad--in fact steel makes possible the standard of living on which civilization depends.

For almost every one of this multitude of uses a special steel is required, and Youngstown maintains a great laboratory and special staffs of research and field experts to find exactly the right steel for every modern use.

### THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon and Alloy Steels  
General Offices  
YOUNGSTOWN, OHIO



# Steber LIGHTING SPECIALTIES

**BRING  
ADDED  
PROFITS**



For use with the new Incandescent Reflector Lamp (R40) for indoor flood lighting and particularly for the new projector lamp (Par 38) for indoor and outdoor service. Portable, fully adjustable, easily and conveniently installed. Special base serves as outlet box cover or can be mounted on table, counter, floor, ceiling or wall.

Order now and cash in on the tremendous demand for this new lighting equipment.

**UTILITE  
Number One**



**YARDLIGHTS**

—Most complete line available. Gooseneck and straight pipe brackets. Durable, sturdy, easy to install and pleasing in design. Biggest demand for lighting on rural electrification projects—Innumerable applications in cities.



**OMNILITE  
FLOODLIGHTS**

—Inexpensive, well designed, substantially made. Junior Omnilites for use around the home and yard where cost heretofore prevented this form of lighting.



**COVERLITES**

—Process enameled reflectors. An outlet box cover, socket and reflector, all in one. Other types with holders permanently attached to reflector can be installed easily on porcelain or brass shell sockets. Particularly useful for low ceiling installations. There is a job for you with Coverlites wherever a bare lamp is still in use.

The Steber line consists of useful and time - saving lighting specialties — all quality products, at attractively low prices; items which fill a definite need and which build up your sales and profits. See your wholesaler or write us direct.

**Steber MANUFACTURING CO.**  
126 NORTH UNION AVENUE CHICAGO, ILLINOIS

*In the News*

[FROM PAGE 56]

**Mankato, Minn.**—Two conferences sponsored by the North Central Associated Electrical Industries were scheduled for February 16-18 to consider a state-wide program of adequate wiring certification in Minnesota.

**Roanoke, Va.**—A full-size house will be erected inside an auditorium, at an electrical show to be held in the Roanoke Auditorium, March 1-4. A unique feature of this exhibit will be the installation of glass strips in the walls and ceilings so that the wiring can be seen.

**Richmond, Va.**—Electrical League of Richmond (Va.) has announced the certification of its first adequately wired home, with others awaiting application and approval.

**Salt Lake City, Utah**—A comprehensive program of adequate wiring promotion is being developed for 1939 by the Electrical League of Utah. This activity will include billboard advertising, increased distribution of promotional booklets and folders, more lectures on the subject of adequate wiring, radio broadcasts and meetings dealing with wiring problems.

**New Orleans, La.**—One of the high-lights of the New Orleans' adequate wiring activity has been the recent adoption of a minimum wiring standard in the specification of a local Building and Loan Campaign by the local Association of Commerce.

**Milwaukee, Wis.**—The force of wiring contact men of the Wisconsin Electric Power Company will be expanded from one to four, under the adequate wiring promotion plans for 1939 in Milwaukee.

**Indianapolis, Ind.**—A model home now being wired according to standards of the national program, will be known and advertised as the Adequately Wired Model Home. It is scheduled to be opened early in March and will be given considerable advertising—including radio.

## RECENT FARM WIRING LOANS

The following REA allotments have been announced to finance house wiring and plumbing installations:

Alabama—\$20,000 for customers in four counties.  
Arkansas—\$3,500 for customers in three counties.  
Colorado—\$5,000 for customers in four counties.  
Florida—\$10,000 for customers in three counties.  
Georgia—\$45,000 for customers in 16 counties.  
Illinois—\$5,000 for customers in Adams county.  
Indiana—\$12,000 for customers in 5 counties.  
Iowa—\$5,000 for customers in five counties.  
Kentucky—\$20,820 for customers in 10 counties.  
Michigan—\$10,000 for customers in 17 counties.  
Minnesota—\$30,000 for customers in 10 counties.  
Missouri—\$29,750 for customers in 16 counties.  
Montana—\$8,000 for customers in Fergus County.  
Nebraska—\$10,000 for customers in two counties.  
New Mexico—\$3,000 for customers in two counties.

**CLOSE CLAMPING JAWS AROUND  
CONDUCTOR...** conductors up to 2" dia.

**READ AC CURRENT  
...1 to 500 Amperes**

**Now!**  
**A WESTON**  
**MULTI-RANGE**  
**CLAMP-AMMETER**

*Providing*

**BROADER UTILITY  
MAXIMUM SAFETY  
GREATER ECONOMY!**

With no connections to make, no interruption of circuits... the self-contained WESTON Model 633 Clamp-Ammeter provides a simple, quick method of measuring AC current flow through insulated or non-insulated conductors. Remote indications, too, may be had... up to 50 feet from the clamping jaws... by plugging the quickly detachable instrument into a special carrying case available for the purpose. Some of the outstanding features of this new Clamp-Ammeter are described at the right. In addition, Model 633 is *attractively priced*. Complete details may be had from the WESTON representative near you, or by writing to Weston Electrical Instrument Corporation, 671 Frelinghuysen Avenue, Newark, New Jersey.

**WESTON**  
*Instruments*

6 current ranges  
...10/25/50/100/  
250 and 500 am-  
peres

For insulated or  
non-insulated  
conductors up to  
2" diameter

Sturdy bakelite  
case, handle and  
trigger... for  
maximum safety

Clamping jaws  
heavily insulated  
... protects op-  
erator... prevents  
short circuits

WESTON instru-  
ment... assures  
long, dependable  
service.

Accuracy guaran-  
teed within 3%  
between 50 and  
70 cycles.

Temperature er-  
ror less than 1%  
from 32° to 110°  
Fahrenheit

Man sized handle  
... proper balance  
for easy handling



**LAST  
CALL!**

If you want to tie in with  
this promotion we must  
have your list of archi-  
tects by March 24th.

Promote . . .  
Better

**H**OW would you like to get electrical specifications from architects that leave no room for guess work?

Would you be willing to help us make it easier for architects to write such specifications? It will cost you nothing but a few minutes' time.

We know that loosely written specifications frequently encourage bids on minimum wiring by contractors who hope to be "low man" and make their profits on extras. If specifications were completely and clearly written, all contractors would be bidding on *known values*. And there

would be fewer headaches and more profits for all concerned.

In June, 1936, ELECTRICAL CONTRACTING published a Master Specifications Issue which was acclaimed by architects and contractors alike. Now, with building again on the march, there is need for a similar job promoting better specifications and greater adequacy.

Our plan is this: in April ELECTRICAL CONTRACTING will carry a 48 page feature section on ELECTRICAL SPECIFICATIONS—*How to Plan and Write Them*. This issue will treat with every phase of specification writing for every class of structure. It will be simply written and help-



# Specifications

**—and protect  
your profits**

fully illustrated, so that the material will be easy to understand and to use.

We plan to place this issue in the hands of every important architect in the country. And that's where you can help us. Won't you send us the names and addresses of architects for whom you figure? We'll send them a copy of the April issue, with your compliments, at no cost or obligation to you.

Your cooperation will help us promote good specifications, good wiring jobs, and protect your profits.

**We must have your list of architects  
by March 24th. Send it in today.**

## ELECTRICAL SPECIFICATIONS

A 48 PAGE FEATURE SECTION  
*in April Electrical Contracting*

### OUTLINE OF CONTENTS

1. Taking the Gamble Out of Wiring
2. Wiring for Residences, Apartment Houses and Farms
3. Wiring Commercial, Institutional and Factory Buildings
4. Engineering Data — Diagrams — Photographs

### MANUFACTURERS' EXHIBIT SECTION

All advertisers will be indexed by products as well as by company names, making it easy for the specification writer to quickly find what is wanted without further reference.

## ELECTRICAL CONTRACTING

*A McGraw-Hill Publication*

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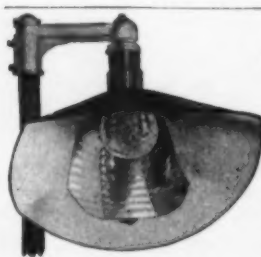
**THOUSANDS ARE  
ACCLAIMING  
THE  
G-E  
SPHINX  
MERCURY  
SWITCH**



Public approval of the G-E Sphinx Mercury Switch introduced last year is unanimous. If you aren't already using this switch order some now and see how quickly your customers will be interested. Available in all standard types. Cushioned action—no noise on make or break. Long life—no spring to break, no blades to hammer away. Ask us also about the new G-E line of White Textolite Lampholders.

For further information, see the nearest G-E Merchandise Distributor or write to Section D-943, Appliance and Merchandise Department, General Electric Company, Bridgeport, Connecticut.

**GENERAL ELECTRIC**



Long Beam Floodlight

**QUAD**

**IS A GREAT  
LINE FOR  
BOOSTING LIGHTING  
UNIT SALES**

★ When Contractors say "It's a great line" and customers say "Entirely satisfactory" you can see that QUAD is the line to sell. It gives you full opportunity to meet any and all lighting requirements, either indoor or outdoor, Industrial or Commercial, for new or replacement work.

Be sure you have the QUAD line of Reflectors in stock. Get details today



Duplex Dome Reflector

**QUADRANGLE MFG. COMPANY**  
32 SO. PEORIA ST. CHICAGO, ILL.

*In the News*

[FROM PAGE 58]

North Carolina—\$28,000 for customers in four counties.  
Ohio—\$15,000 for customers in eight counties.  
Pennsylvania—\$10,000 for customers in two counties.  
Texas—\$10,000 for customers in five counties.  
Virginia—\$8,000 for customers in three counties.

### COMING MEETINGS

Florida Association of Electrical Contractors—Orlando, March 5-7.

National Industrial Service Association—Convention, Jefferson Hotel, St. Louis, Mo., April 17-19.

National Electrical Manufacturers Association—Spring Conference, The Homestead, Hot Springs, Va., May 14-18.

National Electrical Wholesalers Association—Annual Convention, The Homestead, Hot Springs, Va., May 22-25.

Ontario Electrical Contractors Association—Hamilton, Ont., June 1.

Illuminating Engineering Society—Annual Convention, Los Angeles, Calif., August 21-25.

International Association of Electrical Inspectors—Western Section, Hamilton, Ont., Sept. 11-15; Southern Section, Asheville, N. C., Sept. 18-22; Eastern Section, Providence, R. I., Oct. 2-6.

National Electrical Contractors Association—Annual Convention, Bellevue-Stratford Hotel, Philadelphia, Pa., Oct. 9-12.

National Electrical Manufacturers Association—Annual Conference, Palmer House, Chicago, Oct. 23-27.

### CHARLES CREGIER DIES

Charles Knap Cregier, Chief Electrical Inspector of Chicago, died suddenly on January 30. He was 63 years old.

Mr. Cregier, the son of a former Chicago Mayor, was born in 1875. He entered the service of the city of Chicago March 30,



CHARLES K. CREGIER

*Electrical Contracting, March 1939*

# AN ALL-STAR LINE-UP

## FOR ANY ADEQUATE WIRING PROGRAM



RACO • ALL-STEEL Galvanized Box  
Material complies with Federal Spec-  
ification W. O. 521-A.

## RACO • ALL-STEEL • PRODUCTS

● The ability of RACO • ALL-STEEL • PRODUCTS to meet present day wiring requirements effectively and economically has won a nation-wide acceptance from architects, engineers, contractors and dealers. These products provide advantages which are equally important for the increasing number of new building jobs and the steadily growing rural and urban modernization jobs.

Developed by competent engineers who keep pace with the changes in wiring trends, RACO • ALL-STEEL • Products contain features which increase efficiency and comply with local conditions and requirements. For example: the "JK" box, with external clamp shown above, provides maximum space inside of the box for splices, connections, etc.—

equipped with the JK—External Clamps, either metallic or non-metallic cables may be used. The illustration above indicates how the knock-out surrounding the bushed holes for metallic cables may be removed for use with non-metallic cables.

The more than 40 years of experience behind the switch boxes, outlet boxes, cutout boxes, cabinets, fuse cabs and conduit fittings carrying the famous RACO and ALL-STEEL trademarks are your assurance of continued quality and dependability.

Write today for catalog illustrating the complete line—there is no obligation. DISTRIBUTORS IN ALL IMPORTANT CENTERS.

*Distributed Nationally by*

**ALL-STEEL-EQUIP COMPANY, INCORPORATED**

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**RACO • ALL-STEEL • PRODUCTS**

SWITCH BOXES • OUTLET BOXES • CUTOUT BOXES  
CABINETS • FUSE CABS • CONDUIT FITTINGS







**SIMPLEST—  
STURDIEST—  
EASIEST TO RENEW**

**ASK US WHY**

**SHAWMUT  
SHUR-LAG**

**RENEWABLE  
FUSES**

**FERRULE TYPE**

*The* **CHASE-SHAWMUT  
COMPANY**



**NEWBURYPORT  
MASSACHUSETTS**

*In the News*

[FROM PAGE 62]

1897 and was certified as electrical inspector in 1906. He became assistant chief electrical inspector in 1923 and chief electrical inspector in 1930, a post which he held until his death. In addition to his duties as chief electrical inspector, he was a member of the Electrical Council of the Underwriters' Laboratory and in both capacities contributed greatly to advancing the cause of safety and permanency in electrical installations.

**MANUFACTURERS NEWS**

**J. L. Frank Dies**

Harrison J. L. Frank, president of Bull Dog Electric Products of Detroit, died on February 14 at Miami Beach, Florida. He entered the electrical business in 1901 with the Mutual Electric and Machine Co. of Wheeling, became its president in 1915 and in 1927 changed its name to Bull Dog. He was a member of the National Association of Electrical Manufacturers and the International Association of Electrical Inspectors and has been widely known throughout the industry.

**R. C. Lanphier Dies**

R. C. Lanphier, president of the Sangamo Electric Company died at his home in Springfield, Ill., on January 29th after a long illness. He was 61 years old.

"Bob" Lanphier, as he has long been known to electrical men, founded the Sangamo Company in 1899, after two years research on the then new idea of an elec-



**WIRING RURAL HOMES**—S. M. Lantz of Orlando, Florida, has had two wiring crews busy during the fall months completing wiring for 100 farmsteads along Florida's REA lines. Jobs range from \$40 to \$200 each, including fixtures. The Lantz Electric Co. also sells electric water pumping systems to its more progressive farmers at prices ranging from \$60 to \$80 according to size of equipment.

tric meter. The idea had captured his imagination and he went to work on it upon his graduation from Yale. He became president of the company in 1926.

**Roller-Smith Company** of New York announces the appointment of W. R. Swoish as sales manager. His headquarters are at Bethlehem, Pa.

**Joe L. Mullenbach**, president of Mullenbach Electrical Manufacturing Co. of Los Angeles, recently turned over his business to his two sons and started with Mrs. Mullenbach on a tour of the world.

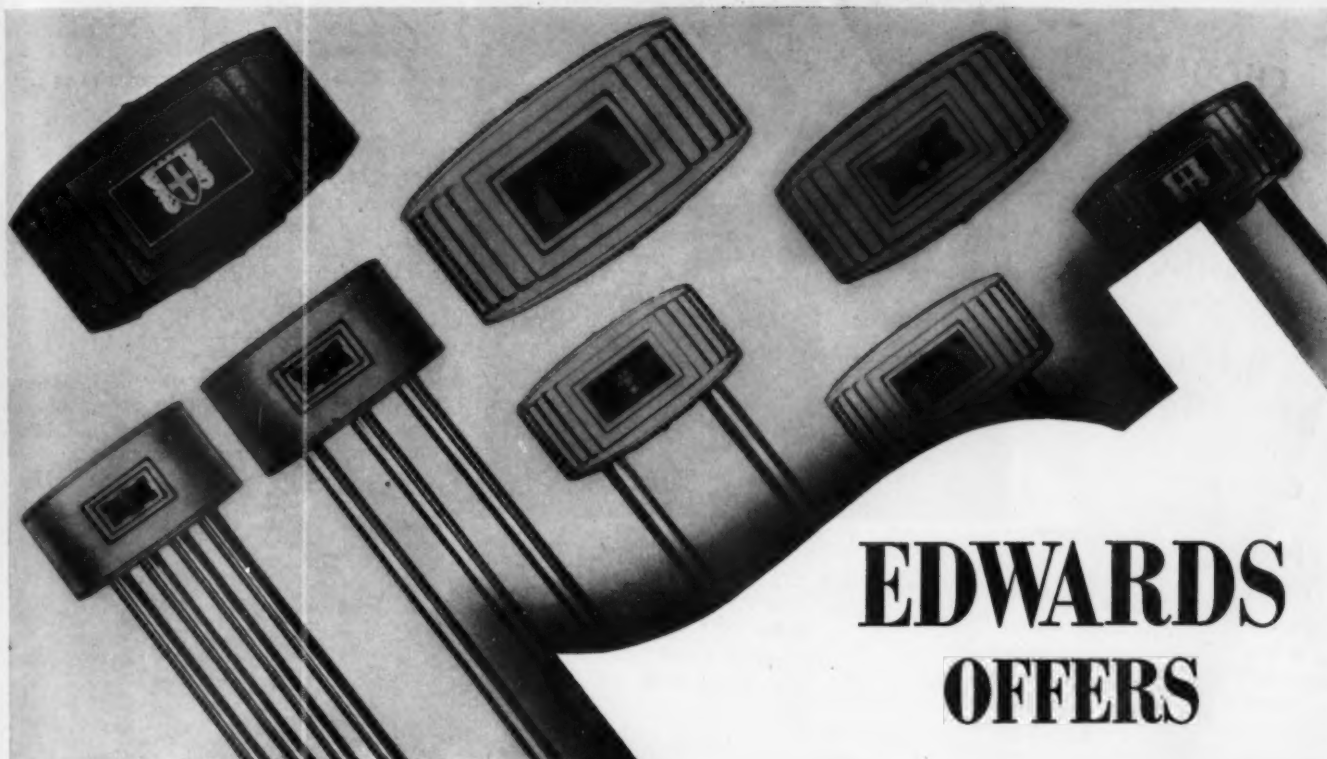
**ENTER THE HERO**

6. "Oh dear noble Mr. Electrician, rescue a lady in distress. My husband's lost his even disposition, and mine is on the run."



"Just you leave it to me, lady—I can fix it easy. Add a few switches and outlets, maybe some heavier wire, and there you are—set for easy living."

**RUB YOUR EYES!**—This picture is from a page article in the February issue of McCall's Magazine, entitled "The Sad Sad Story of Mrs. Jones". It cartoons the troubles of inadequate wiring, the joys of plenty of outlets. It is good to see the women's publications interested in this theme.



## EDWARDS OFFERS

CHIMES FOR EVERY TYPE OF HOME

31 STYLES

\$1.00 to \$38.50

Whether your customer prefers Colonial or Georgian, Early English or Modern, Spanish or Italian, there is an Edwards Chime styled to suit the exacting specifications of home decoration.

Whatever your customers' requirements — for a small chime or a large one — from \$1.00 to \$38.50 — there is a suitable Edwards Chime.

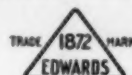
Edwards and Company means everything in electric signaling at its best — not only chimes — but the complete signaling line — its specialty for 67 years — since 1872.

Consumer advertising is now appearing in many national home magazines reaching millions of readers. American women want style — not just a door chime.

Be sure you are prepared to demonstrate the Edwards line of styled chimes. See your Edwards distributor or write to Edwards and Company, Inc., Norwalk, Conn.

**EDWARDS<sup>and</sup> COMPANY**  
INCORPORATED

NORWALK



CONN.



**CHOOSE  
G-E  
BUILDING  
WIRE  
FOR  
UNIFORM  
DEPENDABILITY**

Code, Intermediate,  
30% or  
Permite Insulation

**EASY  
STRIPPING**

**CLEAN  
STRIPPING**

**EASY  
PULLING**

14-GENERAL ELECTRIC

You can always depend on G-E Building Wire. Careful manufacture helps to assure uniform high quality and enduring service. Diameters are uniformly small. Marked for quick identification of size, type, voltage. Different colored braids make circuit testing easy. All of these wires, regardless of grade of insulation, have the same uniform flame-retarding and moisture-resisting finish. Smooth, generous coatings of paraffin help to make wire pulling easy. For further information, see the nearest G-E Merchandise Distributor or write to Section W-943, Appliance and Merchandise Department, General Electric Company, Bridgeport, Connecticut.

**GENERAL ELECTRIC**

# Badger

**Synchronous  
ELECTRIC  
TIME  
SWITCH**

**For Real Profit**

**\$ \$ \$ \$ \$ \$**

Complete dependability in operation is the quality that makes these Badger time switches really profitable for you. Wire 'em and forget 'em—they will give years of satisfactory service.

The complete Reliance line includes the BADGER, RELIANCE, RACINE and the MODEL W RELIANCE—a time switch for nearly every application. Write for full information.

**RELIANCE AUTOMATIC  
LIGHTING COMPANY**

**1937 MEAD STREET  
RACINE, WISCONSIN**



For A. C. loads up to 50 amperes. Furnished in single and double pole types and in either cast iron or sheet steel cases. \$18.00 and up. Underwriters' Laboratories approved.



*In the News*

[FROM PAGE 44]

Harry M. Francis has been appointed assistant vice-president in charge of sales of the American Steel & Wire Company, subsidiary of the United States Steel Corp. His headquarters will be at the main offices in Cleveland, Ohio.

Goodrich Electric Company of Chicago has appointed R. C. Purdy as manufacturer's sales agent in Northern Ohio. Mr. Purdy is also to be representative for Turrell & Benfield, Inc. of Detroit. His address is 13515 Lake Shore Blvd., Cleveland, Ohio.

J. A. Johnson, formerly sales manager of the United Electric Controls Co., is now associated with the Mercoid Corporation, 25 Ivy Street, Boston, Mass.

Frank Garhart, Pacific Coast sales manager of Crouse-Hinds Co., has retired and Horace White, sales manager in the Southern California district, was promoted to his position. Mr. Garhart will continue to act in an advisory capacity.

American Transformer Company of Newark, N. J., has announced the appointment of M. D. Summer as its representative in the six New England states. His headquarters are at 99 Chauncey Street, Boston.



**TVA'S HELPER**—Among the large jobs in various southern states on the list of the Miller Electric Company of Jacksonville, Fla., is a \$500,000 line-building project in the city of Memphis, Tenn. This work is being done in connection with that city's TVA power purchase negotiations. H. G. Miller recently moved his headquarters to a larger space in his own building, where twelve staff members are busy handling engineering and routine details.





## GREATER CONVENIENCE TO USERS Makes It Easier to Sell More New **FA** AC Circuit Breaker Service Equipments

The complete line of NEW **FA** AC Circuit Breaker Service Equipments gives the contractor a new avenue for added profit—because owners quickly appreciate the greater convenience and high-grade appearance of these new units.

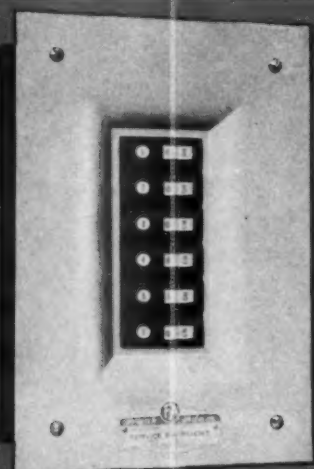
**FA** Service Equipments are furnished for 125 volt AC service, with main lugs, up to 6 circuits in accordance with National Electrical Code requirements. The circuit breakers are single pole for lighting branch circuits or double pole for range, water heater, or sub-feeder circuits to load centers in other parts of the building . . . They can also be furnished with main circuit breaker with any number of branch circuits within National Electrical Code limitations.

### Here are some of the advantages you get:

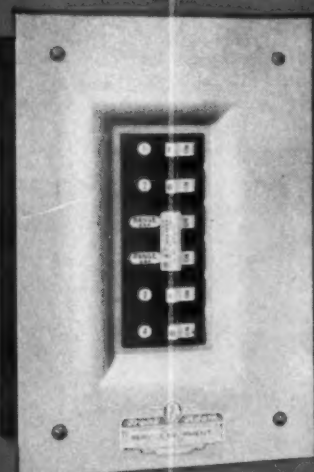
- (1) Owners' and Architects' acceptance—more satisfied customers
- (2) Accurate quotations on time—when you need them
- (3) Prompt deliveries on the job—no lost time
- (4) An accurate fit on the job—standardized construction—no "lost motion"
- (5) A safeguard to the Contractors' good will and reputation
- (6) Immediate deliveries from wholesalers' stocks.

See your nearest **Wholesaler** or write now for complete information and details on the new **FA** AC Circuit Breaker Service Equipments.

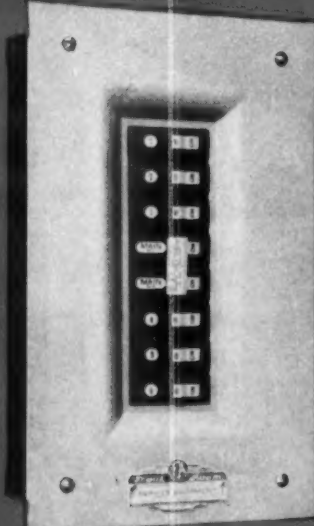
**Frank Adam**  
ELECTRIC COMPANY  
ST. LOUIS



6 Circuit and 100 **FA** AC Service Equipment. Main lugs.



**FA** Service Equipment with **FA** D. P. 35 Amp. AC Circuit Breakers for range circuit. Also 4 S. P. branch circuits.



**FA** Service Equipment with D. P. 50 Amp. AC Circuit Breaker Main and 6 S. P. AC Circuit Breakers of capacities required.



## No Hacksaw Blade Like MILFORD Flexible REZISTORS

SHATTER-PROOF  
HIGH SPEED  
BLADES



HERE'S a hacksaw blade to get really excited about; the new MILFORD Flexible REZISTOR—made from special alloy, high-speed steel that can't shatter! Cuts the hardest metal faster than ever before, yet the MILFORD Flexible REZISTOR with its hard teeth but soft back won't shatter—even under abuse. Of course, like all MILFORD blades, it has the Easy-Starting Teeth. Right now, then—before you forget—why not order these new shatter-proof blades—MILFORD Flexible REZISTORS.

THE HENRY G. THOMPSON & SON CO.  
CHAPEL & MILL STREETS  
NEW HAVEN, CONN.

Just Published

## FRACTIONAL HORSEPOWER ELECTRIC MOTORS

What Kinds Are Available—What Makes Them Run  
and What They Will Do—How to Repair,  
Rewind, and Reconnect Them

By CYRIL G. VEINOTT

Design Engineer, Small Motor Engineering Dep't  
Westinghouse Electric & Manufacturing Co.

431 pages, 314 illustrations, 22 tables, \$3.50

HERE is a new book, so complete, so competent, so practical, that it will serve you as a thorough and dependable textbook and manual. It is for everyone engaged in the manufacture, use, or servicing of fractional horsepower motors, regardless of how much or how little technical training he may have had. Look up in this fact-packed book the specific service problems discussed in connection with 18 major types of motors; the excellent chapter on testing methods; and the many handy tables.

SEE IT 10 DAYS—MAIL THE COUPON

McGraw-Hill Book Co., 330 W. 42nd St., New York

Send me Veinott—Fractional Horsepower Electric Motors for 10 days' examination on approval. In 10 days I will send \$3.50 plus few cents postage, or return book postpaid. (We pay postage on orders accompanied by remittance.)

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Company ..... E.C. 3-39  
(Books sent on approval in U. S. and Canada only.)



### They Work Together

Pete Baldwin, proprietor of the Baldwin Electric Shop, Rutherford, N. J., makes only modest claims as to the volume of business in his town of 16,000 population, but cites with much enthusiasm how he and two fellow contractors make the most of what there is. Each firm has its regular customers and respects the other fellow's list by checking up on credit among the group when someone changes contractors. Little misunderstandings are often cleared up, and what is most important, the slow-pay and "dead beat" element is held in check. Pete says three contractors can all make a go of it, and remain friendly with each other. It's worth trying in other communities—there's no overhead attached.

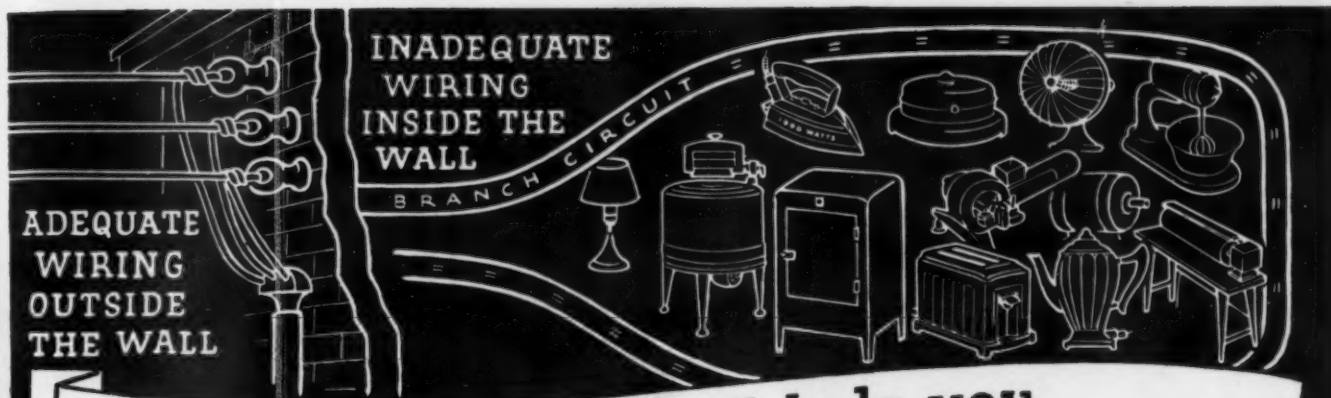


EMPIRE STATER—New York state's electrical problems take up a lot of time for E. G. May, successful electrical contractor of Albany. But "Ed" is never happy unless he's working on state-wide inspection laws, licensing, journeyman training or some other worthwhile movement. He is president of both the New York State Association of Electrical Contractors and Dealers, Inc., and the Albany Electrical Contractors Association, Inc. As chairman of the state committee of insurance he took part in a two-year job of preparing model legislation for city and county inspection and licensing. Mr. May also served on the last committee for the McGraw Award to electrical contractors.

### Handling Problems

Karr Parker of Buffalo, cites the heavy jobs now being done by electrical crews on special industrial construction work of this modern age. Recently McCarthy Brothers & Ford had to handle two 13-ton reels of power cable required for primary feeders serving the transformer stations of an oil refinery installation. It requires more than pipe and wire technique on big industrial jobs.

Electrical Contracting, March 1939



## Let the FUSTAT help you BREAK the "BRANCH CIRCUIT BOTTLE NECK" .. that is hindering the full use of Electricity

The branch circuit is the "bottle-neck" of electric service, because through it flows all the "pay load" to the user. As this "bottle-neck" is overloaded, SATISFACTORY service diminishes because:

1. Overloading usually means a low-voltage condition that causes user dissatisfaction due to inefficient operation of lamps and appliances.

2. Overloading, when continued, often destroys the wiring and causes money loss to the user — revenue loss to the Utility and tremendous loss of good will to the entire industry.

### The Fustat steps in to help correct this overloading evil

Its non-tamperable feature shuts out "handy men" from substituting too large a size, and tampering it in any way to permit overloading is virtually out of the question — without such tampering being clearly visible where it warns the user that all protection is gone.

Since the user can not load a circuit beyond proper capacity of the copper, the Fustat eliminates revenue sapping low-voltage conditions —

And by blocking excessive overloading it prevents overheating that destroys wiring, creates fire hazards and causes costly shutdowns.

#### User can't side-step adequate wiring issue

When additional circuits are needed the user cannot readily side-step the issue at the sacrifice of safety. New circuits that increase efficiency of appliances and encourage their greater use must be installed.

#### Permits more outlets per circuit

Adding a maximum number of outlets is a perfectly safe practice because the Fustat guards the circuit against overloading.

#### Wipes out any excuse for tampering

A Fustat won't blow when washing machines, refrigerators or other motors start because of its long time-lag. It wipes out any excuse for tampering or the use of fuses too large to properly protect when shorts occur in flexible cords.

**It's just good business to sell, install and use Fustats**

#### Guards against blowing of main fuses

The branch circuit Fustat will almost invariably open on a short-circuit or overload, AHEAD of the main fuse or Fustat — because it cannot be replaced by an oversize fuse or readily tampered. When it does open to protect, only the normal load of one circuit is off the line instead of a user possibly having all of his lights and appliances out of service because the main fuse blew.

#### Helps get more appliances on the line

The circuit can be loaded to approved capacity without needless blows—or sacrifice of safety—for the Fustat doesn't blow on starting currents.

#### What is the Fustat?

It is a fuse to which a thermal cutout is added.

It protects like a fuse against short circuits—even high resistance shorts such as occur in flexible cords.

It protects against permanent overloads, even when as light as 25%.

**Yet it will not blow on motor starting currents of washing machines or other appliances.**

It has a base that guards against anyone robbing the circuit of protection.

It fits Edison-base fuse holders through the use of an inexpensive adapter.



Adapter retails at 7½c



# The FUSTAT

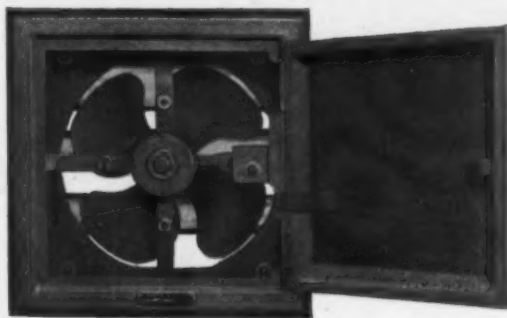
For full information write to any of these firms

BUSSMANN MFG. CO., University at Jefferson, St. Louis, Mo.  
JEFFERSON ELECTRIC COMPANY, Bellwood, Ill.  
KIRKMAN ENGINEERING CORP., 121 Sixth Ave., New York City  
NATIONAL ELECTRIC PRODUCTS CORP., Fulton Bldg., Pittsburgh, Pa.  
UNION INSULATING CO., 27 Park Place, New York City

Retails at 7½c  
in 15 to 40 amp. sizes



## Here's the New SIGNAL AUTOMATIC WALL BOX . . . .



## Kitchen VENT FAN Only

For the Low Priced Field **\$24.00** List

A high quality kitchen vent fan for permanent installation . . . telescopic in design . . . made in sizes to fit walls from 7" to 24" thickness . . . easy to install . . . 10" quiet type fan that moves 500 cubic feet of air per minute . . . outside shutter frame is cast iron with aluminum weather-tight shutters . . . motor is rubber mounted . . . motor operates by opening and closing door.

Write for 1939 fan catalog, merchandising program, and prices.

**SIGNAL ELECTRIC MFG. CO., MENOMINEE, MICHIGAN**

Offices in all principal cities

**SIGNAL**



## Better LIGHT . . . better SIGHT . . . for SCHOOLS

Smart contractors everywhere are raising the standards of lighting in schools . . . and reaping the benefits of profitable Wiremold re-wiring jobs.

Wiremold gives you the ideal wiring method for such work . . . adaptable to every requirement . . . requiring no costly structural changes . . . neat, unobtrusive and efficient in results. And remember, Wiremold products, methods and cooperation give the contractor every advantage in selling, installation . . . and profits.

### HERE'S REAL SELLING HELP FOR YOU

Wiremold data sheets are available showing typical school lighting improvement jobs. They're yours for the asking . . . also Wiremold Engineering service on your own particular jobs. Write us today.



**WIREMOLD**

*Your* **BUSINESS BUILDER**

THE WIREMOLD COMPANY

HARTFORD, CONN.



## Rink Lighting Specialist

St. John, N. B., has plenty of ice for skaters and John B. Jones, local electrical contractor, makes a specialty of lighting skating and hockey rinks. Many of the larger local installations were installed and are serviced by the Jones staff. To encourage ice sports, Mr. Jones lights a neighborhood rink for boys and girls annually, free of charge. His staff maintains this system and in the spring removes the poles and lights to the storehouse, for replacement the following winter.

## Transmission Specialists

Claiming to sell more V-belts, sheaves and pulleys than any four local suppliers, T. T. Evans of Mather, Evans & Diehl Co., Inc. of Utica, N. Y., has demonstrated that a live interest in power transmission is warranted among motor service shops. Mr. Evans cites the logical advantages that fall to customers who deal with motor experts.



**OLD-TIMER**—this fractional horsepower 110 volt, one ampere, direct current portable motor belongs to the days of bi-polar open fields and ring wound armatures. It is a Holtzer Cabot, serial number 5551. V. A. Pinkerton of the Palmer Electric Company, Toledo, Ohio motor shop prizes it highly and would like to know exactly how old it is. Perhaps some reader may know.

## Sell Home Protection

The Shaw Electric Co. of Newark recently completed wiring four large residences in the estate country of New Jersey, the top being a \$14,000 contract. One popular feature was photo-cell protection to guard against prowlers and kidnappers. This proves that adequate and convenient wiring is no longer enough. The element of protection can be sold on many well-planned layouts.

## Inspectors Boost Consultants

A note to contractors in a recent bulletin of Kansas City's Bureau of Electricity contained a friendly gesture from the inspector in support of the competent electrical engineer. Stating that the Bureau's inspectors are relied upon to engineer electrical installations, the bulletin urged those who are not competent in designing a complete system to consult professional electrical engineers. The names and telephone numbers of engineers who make a business of laying out and supervising electrical installations are kept on file at Bureau headquarters.



**BUSY DAYS**—Meeting the deadline for San Francisco's Golden Gate International Exposition involve lighting and installation problems without end for these gents. At the fixture and electrical shop for the fair we see Jean de Ellas (left), shop super and fixture design builder; and George Garthorne, assistant electrical engineer in charge of construction.

## Philosophy

Mottos gracing the walls of electrical contractor's offices are often amusing, sometimes startling. One which hangs over the desk of Ray Scannell of the Scannell Electric Company of Toledo, Ohio has an odd twist to an ancient maxim. "Do unto others as though you were the others." Ethically sound—good business.

## Beware of Burglars

So reads one of several suggested reasons for doing additional wiring, in a mimeographed mailing piece recently sent to customers of Harold N. Lang of Orlando, Florida. Lang's copy reads—"At a very small cost we can install flood lights in your driveway and back yard with switches located at convenient points. These lights will provide protection against night prowlers, winter and summer. Also during the summer nights the light may be used for outdoor entertainment, gardening and repairs in the cool evening."

It seems that Lang and other local contractors have put the yard-lighting idea across in Orlando. While cruising around the residence section at night, an unusual number of Orlando homes can be found with yards and gardens lighted

# DIAL-O-PHONE

## *talks up Better Business*

The improved and up-to-date Dial-O-Phone System is good insurance of dependable service to the user—and generous profits to you. In contrast to the expensive automatic types now on the market, this quality instrument is moderately priced to bring quick sales—and satisfaction.

Connecticut Dial-O-Phone is attractive, flexible and easy to operate, affording selective ringing and talking without a central switchboard. It is available in capacities of 8, 12, 18, or 24 lines, with code or general call features in addition if desired.

Hand phones can be furnished with all types of Dial-O-Phone instruments, but watch case receivers are supplied with surface wall and flush types unless otherwise specified. Regular service lines, with rectifier or batteries may be used for power.

Send for complete information on Dial-O-Phone and other modern communicating systems, hospital devices, and signaling equipment.



No. 1200W Cradle  
Type Dial-O-Phone



No. 1250W Surface  
Type Dial-O-Phone



No. 1240W Flush  
Type Dial-O-Phone

## CONNECTICUT TELEPHONE & ELECTRIC CORPORATION

Established 1894

Division of Air Devices Corporation  
MERIDEN . . . . . CONNECTICUT

# SORGEL AIR-COOLED Transformers

for all voltages  
up to  
**13,200 Volts**

single phase  
and polyphase

SIZES UP TO  
**600 Kv-a**

for indoor installations  
**without  
fire-proof vaults**



No oil or liquid of any kind  
required. No upkeep.

Being Air-Cooled, SORGEL Air-Cooled Transformers can be installed easily and economically in any convenient place inside of buildings, or right where the change of voltage is wanted.

**SORGEL ELECTRIC CO.**  
No. Plankinton Avenue Milwaukee, Wis.



## Cashing In

When sterilamps were first announced Al Bonahur of the S. J. O'Brien Sales Corp., New York, saw business in store for the contractor. One of the first large installations was sold to a cosmetics manufacturer, now operating five months. So this company is starting out now to apply sterilizing lamps to walk-in meat boxes, bakeries and other prospects.



**MIAMI'S BALM**—Royal palms line the flower-clustered yard of Fred H. Stewart, executive committeeman of the Florida Electrical Contractors Association. Who wouldn't pose before such a lovely home in Miami and feel a bit sorry for snow shovelers up north? The Stewart Electric Co. Handles commercial and industrial work in the greater Miami area, with headquarters in a separate office and warehouse located back of the Stewart residence.

## Shop Necessities

Smooth foot-pedal starting of a.c. winder drives has always been desirable in motor shops. With E. F. Nelson it has been a matter of trying to work out a dependable clutch to do the job for all sizes of machines. Today the I. R. Nelson Co. of Newark has its own clutches on various winders that will handle the thinnest wire without breakage.

## Better Business

Waiting for better business conditions to chase customers into the shop is a long wait, believes Joe Ferrari, of Excel Electric Service Company, streamlined Chicago motor shop. With business on the upgrade Excel has added two more sales engineers to the staff to beat the bushes, revive dormant accounts and give old customers better service in 1939.

## Industrial Selling

An industrial analyzer test of 30 motors in a Florida industrial plant was recently made by the Orlando Armature Works which disclosed six motors seriously overloaded or underloaded. Corrections were made which saved 3,000 kw.-hr. per month. J. Howard Lott cites this case as an example of latent opportunities for industrial business which can only be uncovered by means of a modern fact-finding approach.

## Home Wiring Technique

With Raymond J. Ball of Syracuse, N. Y., this matter of selling comfort and convenience in new homes is a business that pays. With a record for wiring most of the better homes built in that city during the past few years, Ray stresses the greater safety in the use of shorter cords. That means more outlets to Ray, often 150 or more in a house, but to owners—more safety by eliminating long dangling cords.

## Spare Motor Overhead

Competition for repair business sometimes requires emergency or spare motors to be loaned while repairs are made to customer equipment. Joe Jamieson of Sterns Electric Equipment Co., Buffalo, calls it bad business unless equitable rentals are charged. First, the spare motor must be in good shape to handle the load—cripples won't do. And when returned from a grain elevator or other dirty industry, there is a thorough cleaning job to do. It all eats up the profits.



**UTICA PIONEER**—For forty-five years, H. G. Hatfield has survived the ups and downs of the electrical business in Utica, N. Y., and is still going strong. With a neat store for its headquarters, the H. G. Hatfield Electrical Corp. engages in the larger type of public building and industrial work in central New York State.



## The Use And Care of Mica

[FROM PAGE 20]

assurance that when needed they will be in suitable condition for use, certain precautions should be taken in storing them. For convenience these products can best be handled in three following groups—

1. *Mica Plates:* These include all of the solid, hard pressed type which require heat to soften the bond for forming or for curing. In storing, protect them from physical injury and dirt. They should be handled carefully and as little as possible, to avoid damaging the edges. A lining of soft felt in such bins will assist in this protection. If stored in a clean dry room and handled carefully, the plates will remain indefinitely in satisfactory usable condition.

2. *Mica Wrappers:* These are of the flexible type and must remain pliable for cold forming or applying without heat. The bonds contain plasticizers to keep them flexible and if exposed to the atmosphere unprotected will gradually dry out and become unfit for use. When stored for long periods their useful life can be extended by placing in sealed containers. The container should be made comparatively air-tight and a shallow pan containing denatured alcohol, or other suitable solvent, placed in the bottom so as to permit the solvent vapors to circulate freely among the sheets.

3. *Mica Tapes:* These are usually shipped in sealed tin containers to prevent evaporation of the solvent. Mica tapes that are packed while fresh and kept sealed, will retain proper flexibility for months. If part of the tape is removed the container should be resealed immediately. If the container has been opened a number of times or the tape has been exposed so long that it has begun to lose its flexibility, it is advisable to place a small sponge, saturated with solvent, in the can with the tape and reseal the can. This will replace the evaporated solvent and keep the tape in first class condition.



**FROM ST. PETE**—Active in getting Florida's contracting affairs to function happily is William A. Brinson of St. Petersburg. The Brinson Electric Company was recently moved to new and larger quarters amid the pressure of a rush in fall business. Things in "St. Pete" are moving along nicely, and Mr. Brinson finds enough customers willing to pay for quality workmanship to report business good.

# It shines for you!



For 60 years it has been General Electric's policy to manufacture quality products, to price them fairly, and to deal fairly with its customers.

As a result, today, General Electric is one of the best-known names in the electrical industry, and the General Electric monogram is one of the best-known and most-respected trademarks in the entire world.

In a word, General Electric products have acceptance, and certainly this is true of General Electric Fans, the first electrical appliance manufactured by the General Electric Company, and a product whose sales to date, to customers of all types, add up to millions of units!

This background of experience and prestige is a bonus you get when you carry G-E Fans. You pay nothing for it, because General Electric Fans

are competitive in price with other high-quality fans. Why not enjoy it?



The salesman of your local G-E Fan Distributor will be around soon to show you his copy of the unique G-E Fan Portfolio, "LET'S GET DOWN TO BRASS TACKS." Watch for him—listen to him—and profit by his sound advice!

APPLIANCE AND MERCHANDISE DEPARTMENT  
GENERAL ELECTRIC CO., BRIDGEPORT, CONN.

## GENERAL ELECTRIC

**Keep UP-TO-DATE on new developments**  
through this

## **FREE SERVICE**

*Electrical Contracting brings you the  
latest literature of leading manufac-  
turers without cost or obligation*

### **LIGHTING SPECIALTIES**

**1** Bulletin No. 102 describing and illustrating floodlighting equipment for outdoor and indoor service. Catalog No. 101 features Sight-Craft luminaries. Steber Manufacturing Co.

### **BUS & CABLE CONNECTORS**

**2** Bulletin 38-D consists of 168 pages of data on bus and cable connectors, conductor fittings, both clamp and solder. Includes many illustrations and specifications on all types of this equipment. Delta Star Electric Co.

### **FANS**

**3** Catalog No. X-3349 listing 26 pages of many types of fans, including desk and stand fans, air circulators, ceiling fans, exhaust and ventilating fans. Descriptions, detail construction features, performance and prices are given. Emerson Electric Manufacturing Co.

### **SYNCHRONOUS MOTORS**

**4** Booklet B-2164 tells how to select the proper synchronous unit for the application, and showing advantages. Application data and their typical torque requirements are listed. Westinghouse Electric & Manufacturing Co.

### **CLAMP-AMMETER**

**5** Folder describing and illustrating Clamp-Ammeter known as Model 633. It has six ranges and is self-contained. Weston Electrical Instrument Corp.

### **MOTORS**

**6** Catalog No. 39, consisting of 26 pages of data and illustrations and price list on electric motors, generators and ventilating equipment. Diehl Manufacturing Co.

### **FLUORESCENT LAMPS**

**7** A booklet describing the fluorescent mazda lamps. Contains actual and suggested applications. General Elec. Co.

### **INSTRUMENTS**

**8** A folder illustrating the line of indicating, recording and controlling in-

struments for measuring and controlling temperatures, pressures, flows, liquid levels and humidity. Brown Instr. Co.

### **OVENS & DRYERS**

**9** A bulletin featuring industrial ovens and dryers. Also shows charts on heating efficiencies and moisture carrying capacity of air. Falstrom Co.

### **CABLE JOINTS**

**10** A 16-page booklet GEA-2989 entitled "How to Make Cable Joints—Portable Cable". Gives instructions for splicing and vulcanizing all principal types of rubber-insulated, rubber-jacketed portable cable. General Electric Co.

### **TOOLS**

**11** A 56-page catalog of portable electric tools and accessories. Illustrations, specifications and price list given. Black & Decker Mfg. Co.

### **WELDING CONTACTOR**

**12** Descriptive data 18-345 is a 4-page illustrated booklet on Weld-O-Tool electronic power switch for controlling the primary of welding transformers and suitable for use with existing timing devices and for welding mild steel products and other metals. Westinghouse Electric & Mfg. Co.

### **LIGHTING EQUIPMENT**

**13** Bulletin 38-110 describes and illustrates fluorescent reflectors and lighting equipment. Garden City Plating & Mfg. Co.

### **MOTORS**

**14** A 4-page illustrated leaflet on hoist and crane motors, designed to meet exacting electrical and mechanical requirements of severe reversing and plugging service with frequent starting and stopping. Descriptive Data 3530. Westinghouse Electric & Manufacturing Co.

### **TRANSFORMERS**

**15** Folder GES-2038 is the story of the development of the G.E. spirakore transformer Bulletin GEA-3085

describes and illustrates the spirakore distribution transformers. General Electric Co.

### **FUSE PULLER**

**16** A folder describing the fuse pullers for adjusting switch and fuse clips. Available in four sizes. Trico Fuse Mfg. Co.

### **MOTORS**

**17** Bulletin 146 featuring Slo-Speed motor. It also shows applications. Bulletin 148 describes and illustrates the pipe ventilated motor. Sterling Electric Motors, Inc.

### **GEARMOTORS**

**18** Leaflet 2293-B, featuring compact self-contained gearmotor speed reducers for efficient low-speed operation. Presents many line drawings and installation photographs. Also table of ratings and speeds with 1750 rpm motors. Allis-Chalmers Mfg. Co.

### **SWITCHES**

**19** Bulletin 33-B, describing and illustrating indoor disconnecting switches and fuse mountings, operating mechanisms and accessories. Delta-Star Electric Co.

### **CONTROL EQUIPMENT**

**20** Catalog listing control apparatus, rheostats and resistors. Includes illustrations, data, dimension tables and price lists. Schaefer Bros. Co.

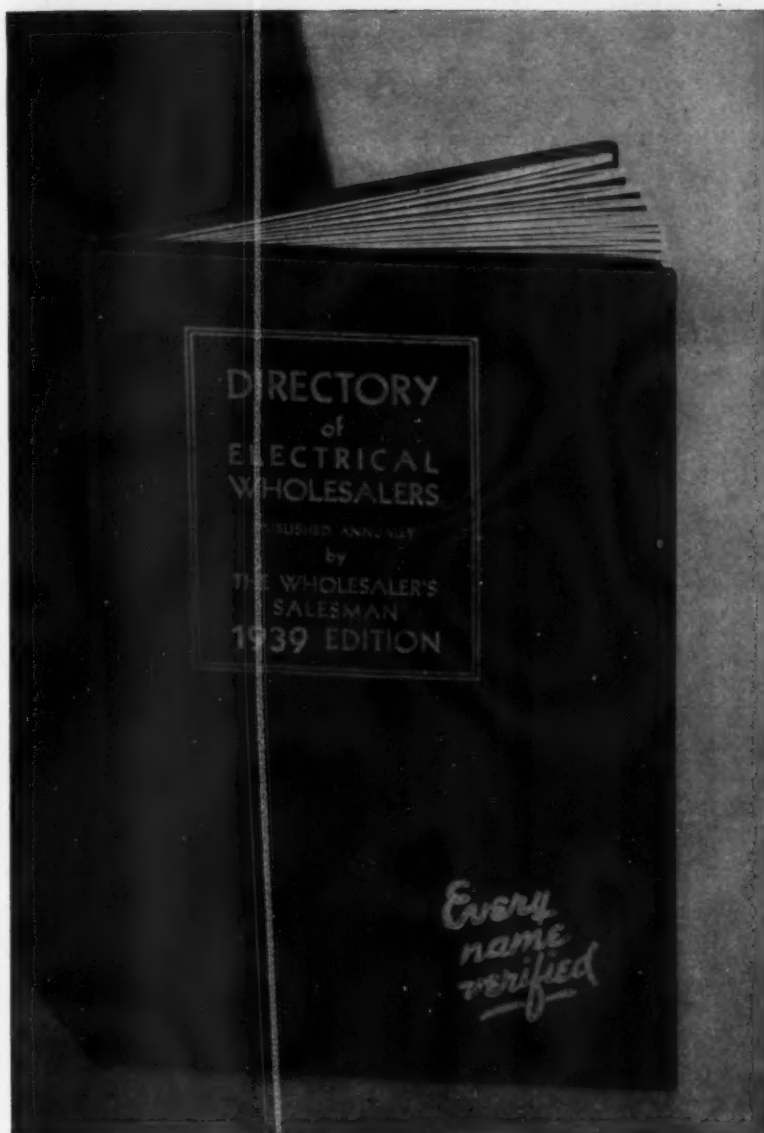
### **NEMA STANDARDS & DEFINITIONS**

**21** Bulletin No. 610 is a condensed 8-page booklet including general information on NEMA standards and definitions. Includes suggestions for selection of motors, types of drives, various types of protected motors and their definitions. Louis Allis Co.

### **CABLE**

**22** Folder describing Sunex Security-flex cable for use in the coal mining industry. Anaconda Wire and Cable Co.

(Continued on page 76)



# 1939 EDITION JUST OFF THE PRESS

*Over 80% of last year's listings have been revised!*

**An essential  
sales tool for  
every electrical  
manufacturer**

Accurate, up-to-date  
information includes  
the following:

- Name and address of firm
- Branch and affiliated houses
- Names of officers and  
department managers
- Name of purchasing agent
- Territory covered
- Number of salesmen—  
city, country, counter
- Floor space occupied
- Regular inventory
- Lines handled—supplies,  
appliances, radio, fixtures
- Year business was established
- Memberships in national and  
local wholesale associations

One of the most valuable sales aids you can have is accurate, up-to-date information about electrical wholesalers. Incorrect data is more than misleading—it can cost you real money in lost sales and misdirected effort.

The new Directory of Electrical Wholesalers—1939 Edition—is now ready for delivery. It contains several thousand corrections, revisions, personnel changes and additions. Many wholesalers have qualified for listing; some have been dropped.

A 1939 Directory will save sales time and answer many day-to-day questions on the problem of distribution. Order your copy today.

**\$15.00 for first copy. \$7.50 for  
additional copies to same manufacturer**

**The Wholesaler's Salesman**

330 West 42 St.

New York, N. Y.



## CONTROL APPARATUS

**23** Catalog of 52 pages, with data on safety switches, entrance equipment, meter troughs, multi-breakers, manual starters and controllers, magnetic motor control, knife switches, solderless connectors, panelboards, switchboards. Trumbull Elec. Mfg. Co.

## CONDUIT FITTINGS

**24** Catalog No. 11 consisting of 480 pages of listings of threaded and no-thread Unilets, explosion-proof Unilets, lighting fixtures, dead-end circuit breaking plugs and receptacles. Appleton Electric Co.

## ATTIC VENTILATORS

**25** Catalog No. 1957 illustrating and describing attic ventilators for summer comfort. Diehl Mfg. Co.

## PANELBOARDS AND CABINETS

**26** Bulletin No. 57 consisting of 16 pages of data on the Dubrak circuit breaker panelboards and cabinets. Specifications and price list also given. Frank Adam Electric Co.

## MILL MOTORS

**27** Bulletin C-4 features P&H heavy-duty d.c. mill motors. Cross-section drawings included. Harnischfeger Corp.

## DRILLS

**28** Folder GT-103 describing and illustrating the Carboloy masonry drills. Prices and specifications are given. Carboloy Company, Inc.

## PHOTO-ELECTRIC CONTROL

**29** A booklet entitled "Marvels of the Electric Eye". It gives a clear conception of this interesting field in terms that laymen will understand. United Cinephone Corp.

## LIGHTING FIXTURES

**30** Booklet on lighting fixtures for fluorescent lamps, for industrial and commercial applications. Foot-candle data also given. Wheeler Reflector Co.

## INSTRUMENTS

**31** Catalog 48-a listing the complete line of 3 inch and 4 inch, round and square, a.c. and d.c. ammeters, milliammeters, microammeters, voltmeters, single and polyphase wattmeters, pyrometers. Roller-Smith Co.

## CONDUIT FITTINGS

**32** Bulletin No. 1115 listing details, price list and illustrations on FS and FD Series Pylets. The Pyle-National Co.

## MOTORS

**33** Manual 21-121 outlining the installation, care and adjustment of fractional horse power capacitor single phase motors. Century Electric Co.

## LIGHTING FIXTURES

**34** Bulletin H featuring fluorescent lamp fixtures, including show case, cove, bracket, indirect lighting troughs, color-matching, surface and inspection fixtures. Day-Brite Lighting, Inc.

## TOOLS

**35** Catalog consisting of 56 pages of the "Red-Head" line of portable electric tools. Specifications, price list and illustration of each tool. Van Dorn Electric Tool Co.

## PORTABLE HAND LAMP

**36** Folder describing and illustrating Big Beam, a new super-power portable electric hand lamp that is rechargeable. U-C Lite Mfg. Co.

## PIPE THREADERS

**37** A broadside giving information on the new No. 64R and 85R series pipe threaders, with all-steel and malleable-alloy construction. Ridge Tool Co.

## LIGHTING FIXTURE

**38** A folder illustrating and describing the Curtistrip fluorescent lamps and fittings. Many application drawings included. Curtis Lighting.

## MOTOR APPLICATION CHART

**39** Bulletin No. 515 is a chart listing 26 different types of motors. Also checks the proper type of motor recommended for about 50 standard applications. Louis Allis Co.

## SIGN-FORMER

**40** A folder featuring the luminous tube sign-former. Electrical and mechanical specifications are also given. Sola Electric Co.

## PANELBOARDS

**41** Folder illustrating and describing steel panels, with construction data and specifications. Falstrom Co.

## GRINDERS

**42** Bulletin featuring heavy duty portable grinders and attachments. Include specifications and price list. Diehl Manufacturing Co.

## CONTROL UNITS

**43** Catalog section 61-275, describing and illustrating control units used with tubular fluorescent lamps to maintain current and voltage at proper values. Westinghouse Elec. & Mfg. Co.

## MOTOR STARTER

**44** Bulletin GEA-2964, presenting a full-voltage magnetic motor starter, designed for machines. General Electric Co.

## MOTORS

**45** Bulletin No. 1195 entitled "Save on Service Costs with 'Lo-Maintenance' Motors." Illustrates and gives case studies on squirrel cage induction motors. Allis-Chalmers Mfg. Co.

## LINESTARTERS

**46** Pamphlet No. B. 2131, illustrates and describes the combination linestarters, combining "De-ion" line-starter and Nofuze "De-ion" circuit breaker. Westinghouse Electric & Manufacturing Co.

## TIME SWITCHES

**47** A folder describing and illustrating time switches, flashers, interval timers. Prices are also given. Automatic Electric Manufacturing Co.

## INTERCOMMUNICATING SYSTEM

**48** A folder describing Dictograph automatic exchange, a completely efficient interior intercommunicating system known as Dicto-Matic. Dictograph Product Co., Inc.

## CIRCLE NUMBERS—SIGN—AND MAIL

### ELECTRICAL CONTRACTING

March

330 West 42d St.

New York, N. Y.

(Not good after May 1)

Please send me without obligation, manufacturers' literature herein described and identified by numbers circled below.

1	2	3	4	5	6	7	8	9	10	11
12	13	14	15	16	17	18	19	20	21	22
23	24	25	26	27	28	29	30	31	32	33
34	35	36	37	38	39	40	41	42	43	44
45	46	47	48							

NAME.....TITLE.....  
 COMPANY.....  
 ADDRESS.....  
 CITY.....STATE.....

**To Help You Specify  
and Buy Electrical and  
Allied Products**

Manufacturers' names and addresses — trade  
names — helpful advertising — all bound together  
in stiff covers to save you time and money  
throughout 1939

**ELECTRICAL  
BUYERS REFERENCE**

**1939**

*"Who Makes It"*

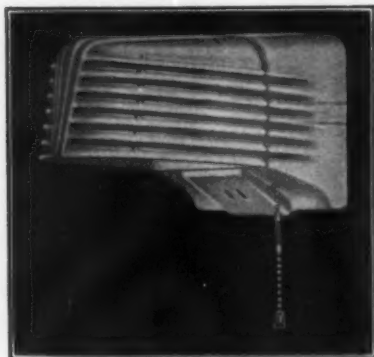
**1939**

# EQUIPMENT

# News

## Bracket Fixture

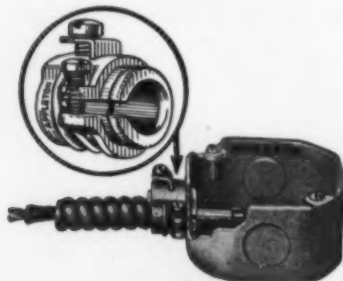
Alabax streamlined wall brackets are easy to clean, will not tarnish. They combine a porcelain fixture and opal glass shade to give the appearance of being a one-piece unit. Made with or without convenience outlet below 60-watt lamp shade. Stock fixture colors—white, black, ivory and light green glaze. Shade furnished only in white opal. Complete units include Alabax swivel strap for easy installation, chain insulator and snub on pull socket. Furnished also with keyless socket. Fixture base  $4\frac{1}{2}$  inches square. Pass & Seymour, Inc., Syracuse, N. Y.



ALABAX BRACKET FIXTURE

## Connector

A new connector known as "Loxbox", requires no locknut. By turning a screw located adjacent to the screw which tightens the clamp, the jaws of this connector expand and bite into the box, assuring perfect ground. No. 7215-V connector is adapted for "ABC" armored cable and No. 7216, equipped with adjustable clamp, will accommodate nonmetallic sheathed cable, romex etc. Appleton Electric Company, 1701 Wellington Ave., Chicago.



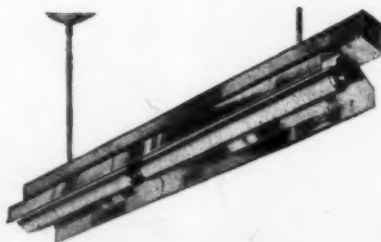
APPLETON ELECTRIC CONNECTOR



SQUARE D MULTI-BREAKER PANEL

## Multi-Breaker Panel

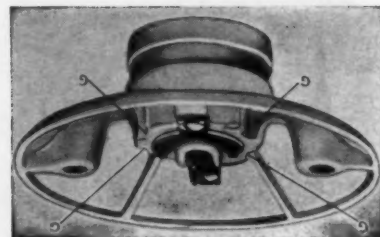
Type NMM multi-breaker panelboards are designed to meet the need of a moderately priced circuit breaker panel for store buildings, schools, office buildings, public institutions, large modern houses, industrial plants, etc. Type NMM is also available with main lugs only. Can be had with any number of single pole or double pole breakers in branches, but any one panel is limited to 40 breaker poles. Several types available, all equipped with adjustable mountings for interiors. Square D Company, Detroit, Mich.



WILSON FLUORESCENT UNIT

## Fluorescent Unit

A fluorescent lighting unit designed for industrial inspection lighting, continuous lighting over work benches and similar applications. Available either in single units or continuous installations of any desired length. Reflectors available in either Alzak processed aluminum or standard polished aluminum. Wilson Lighting, Inc., 411 South Clinton Street, Chicago, Ill.



G.E. RECEPTACLE

## Receptacle

A new keyless receptacle made of white Textolite. Designated as Cat. No. GEO88, this device replaces the standard porcelain receptacle formerly known by this number. Binding screws accommodate No. 12 wire, which provides greater wiring flexibility. Diameter of base has been increased, adding to overall appearance and making for a better installation. To prevent moisture drainage, four removable knockouts are provided which do not affect external appearance of receptacle. General Electric Co., Bridgeport, Conn.



IDEAL BALANCING WAYS

## Balancing Ways

A new unit for the static balancing of motor armatures. No leveling or setting-up time is required, place ways on floor or bench and they are ready for use. No centers required for balancing, as free turning semi-steel discs mounted on precision ball bearings, carry the armature. Standards which support revolving discs are adjustable to take any size armature within the limits of the machine. Available in many shaft lengths. Ideal Commutator Dresser Co., 1041 Park Ave., Syracuse, Ill.

## Weatherproof Sockets

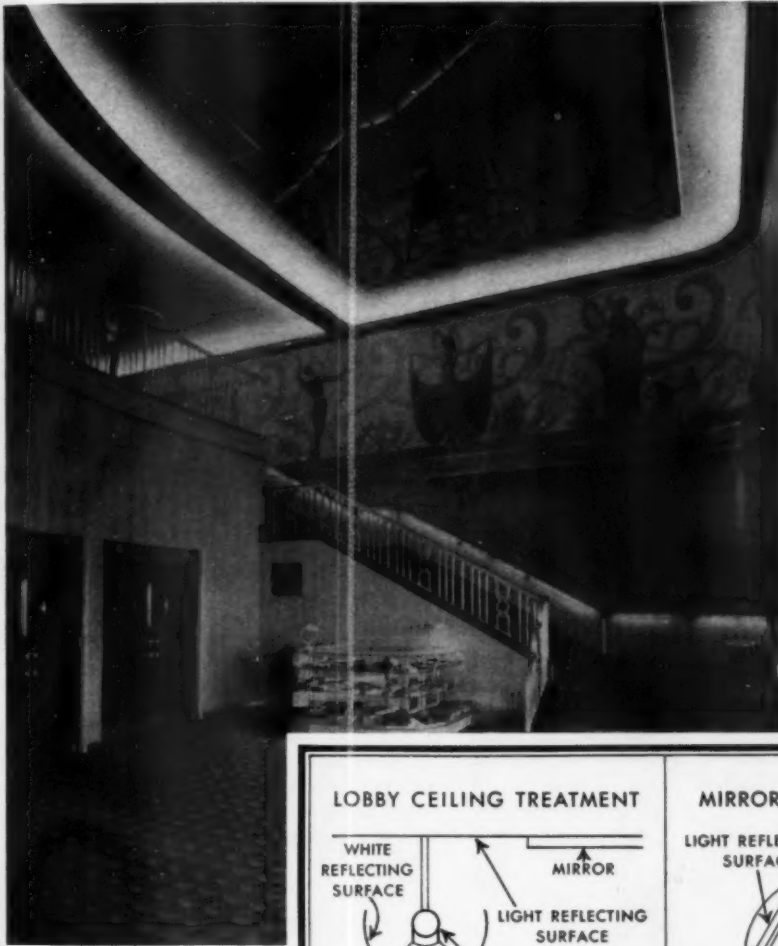
A new line of weatherproof sockets, with die cast, zinc base hood, designed to stop corrosion in all weather. Available with  $\frac{1}{2}$ -in. straight or angle cap for 2 $\frac{1}{2}$ -in. shades or  $\frac{1}{2}$ -in. cap without shadeholder. Come in aluminum or green finish. Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.



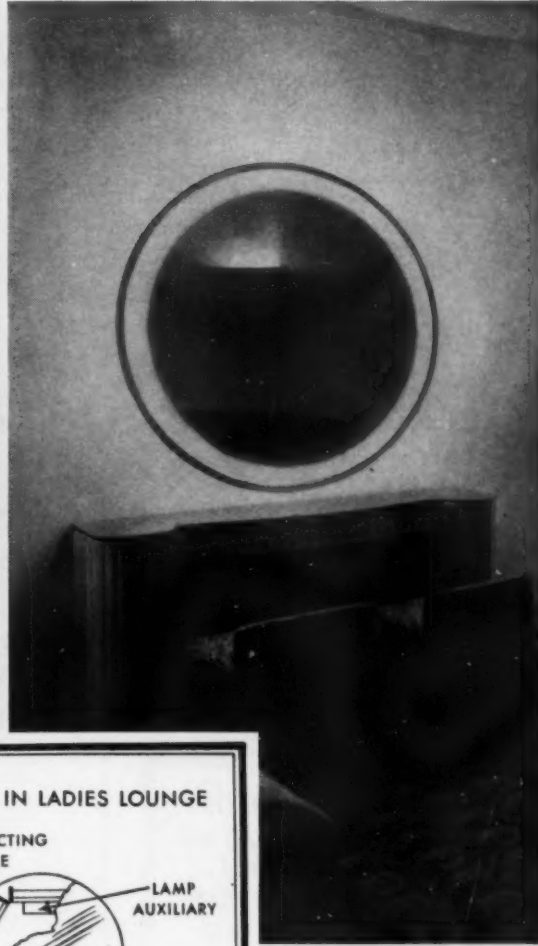
ARROW-HART & HEGEMAN SOCKET



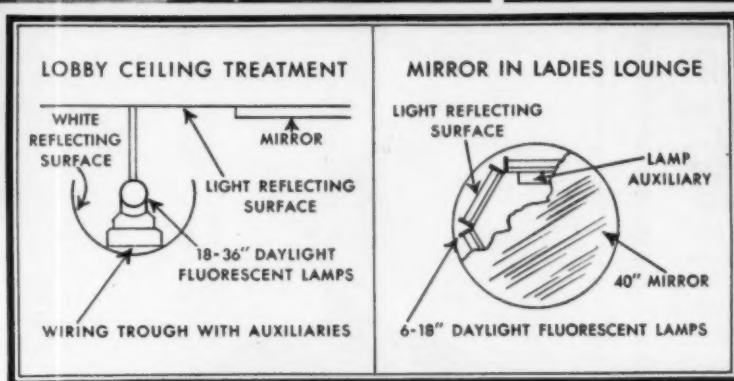
# THEATRE LIGHTING JOBS WITH FLUORESCENT LAMPS NET CONTRACTORS *double profit!*



The new Lakewood theatre lobby in Dallas is lighted with daylight fluorescent MAZDA lamps, used in silhouette strip lighting of the mirror ceiling. E. C. Zrenner of the Interstate Circuit, and H. F. Pettigrew, architect, planned this installation.



Daylight fluorescent lamps behind the mirror provide well-diffused light in the ladies' lounge. A wall urn with incandescent lamps can be seen in the mirror.



**T**HERE'S a good double profit for electrical contractors who install G-E Fluorescent MAZDA lamps in theatres, stores, shops, factories, and other places. Because the sale of these lamps is limited to those channels that can handle the necessary installation work, you can make two profits . . . from the sale of the lamps and from the installation work.

The new Lakewood Theatre in Dallas, Texas, offers a good example of the effective use of fluorescent lighting. In the lobby, daylight fluorescent MAZDA lamps have been used for silhouette strip lighting of the mirror ceiling. In the ladies' lounge,

they have been used behind the round mirror to provide well-diffused lighting.

G-E Fluorescent MAZDA lamps give from 3 to 200 times more light than incandescent lamps of the same wattage and color . . . and for the same amount of light they are 50% cooler. The daylight lamp gives the closest approach to real daylight ever produced at high efficiency. The colored lamps—pink, blue, green, red, gold, and warm white—offer wide opportunity for decorative installations.

For useful information, write General Electric Co., Dept. 166-EC-C, Nela Park, Cleveland, Ohio, or mail coupon at right.



G-E Fluorescent MAZDA lamps come in 18, 24, and 36-inch lengths and in several wattages. Because they are essentially arc lamps, they require special control equipment which is available.

General Electric Co., Dept. 166-EC-C,  
Nela Park, Cleveland, Ohio.  
Please send me your new free booklet giving  
useful information about G-E Fluorescent  
MAZDA lamps.

Name.....  
Company.....  
Street.....  
City.....State.....

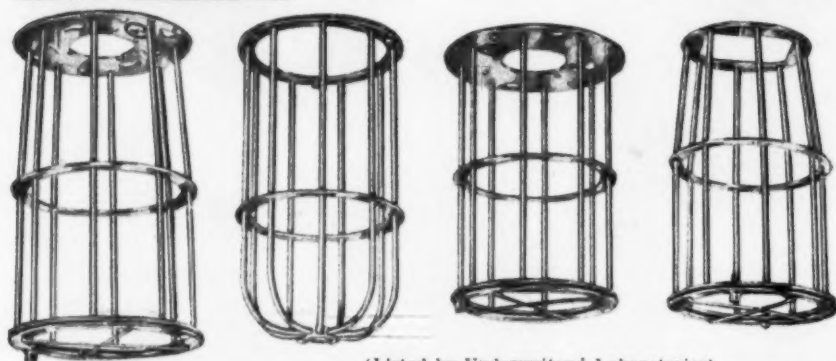
## GENERAL ELECTRIC



## Get Protection with CRESCENT WALL GUARDS

Everywhere that protection against breakage, theft, or both is essential, CRESCENT Wall Guards are widely used. You will find them in public buildings, schools, theatres, hallways, railroad terminals, subways and on loading platforms. These guards cannot be knocked off accidentally . . . the key-hole slots in their base rings permit easy installation and removal without expensive changes.

**MCGILL MANUFACTURING CO.**  
Box 670 Valparaiso, Indiana



(Listed by Underwriters' Laboratories)



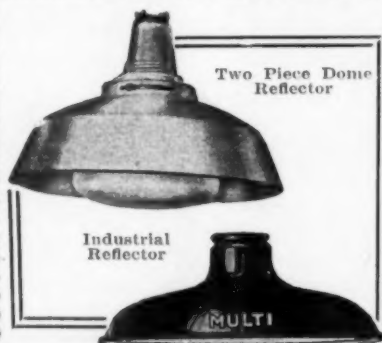
**THE MOST  
VERSATILE  
TIME  
SWITCH  
ON THE  
MARKET!**

**MODEL 150-B  
\$15.00**

- ★ Completely adjustable in steps of one-half hour.
- ★ Provides one, any number, or any combination of half-hour periods desired.
- ★ Can be connected to provide either open-circuit or closed-circuit periods.
- ★ Can also be connected for use as an adjustable single-pole, double-throw Time Switch.
- ★ Ideal for controlling heating, ventilating, air conditioning, or any other equipment in half-hour periods.

Write for Information

**AUTOMATIC ELECTRIC MFG. CO.**  
MANKATO, MINNESOTA



Two Piece Dome Reflector

Industrial Reflector

MULTI

## MULTI REFLECTORS

JUST RIGHT  
FOR YOU AND YOUR  
CUSTOMERS

Here are reflectors that meet any lighting demand. Lighting is of paramount importance in offices, shops, factories, etc. so, install MULTI Lighting Units and you have a good looking job that gives you no more worry. The profit is just as sure and it's substantial too. Get our handy indexed 88-page catalog on our complete line.

**MULTI ELECTRICAL MFG. CO.**  
1840 W. 14TH ST. CHICAGO, ILL.

**EQUIPMENT** *News*

[FROM PAGE 78]

### Lighting Unit

A new unit for use with the incandescent projector flood, projector spot and reflector lamp for outdoor lighting and in stores, offices and factories. Weatherproof and heat-resisting gasket between holder and lamp. Base will serve as an outlet box cover or can be mounted on table, counter, shelf, floor, ceiling or wall. Steber Manufacturing Co., 126 North Union Ave., Chicago, Ill.



STEBER UTILITE NO. 1

### Lighting Fixture

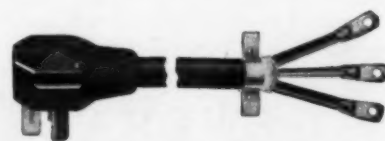
Wall bracket, No. 30-18, is designed to accommodate an 18-in. fluorescent lamp. Furnished wired with sockets and auxiliaries which are housed inside metal channel, but less the bulb. Available in satin chrome finish. Center screw and box strap furnished for fastening direct to outlet box. Gruber Brothers, 72 Spring St., New York.



GRUBER LIGHTING FIXTURE

### Range Cord Set

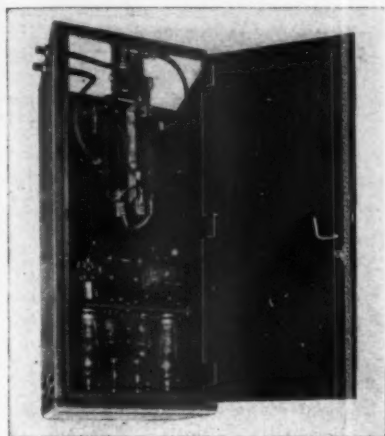
A new range cord set with bakelite cap and rubber cable, without grounding prongs. Cord is gripped tightly by neck of cap, relieving strain on prong and cable connections. Each set is equipped with clamp for attaching cord to a range connection box. Copper terminals are connected to each conductor and marked with wire size. Available in 35 and 50 amperes, 250 volts, standard length, 36 inches. Two No. 8 and 1 No. 10 conductors, or 2 No. 6 and 1 No. 8 conductors. Bryant Electric Co., Bridgeport, Conn.



BRYANT RANGE CORD SET

## Welding Timers

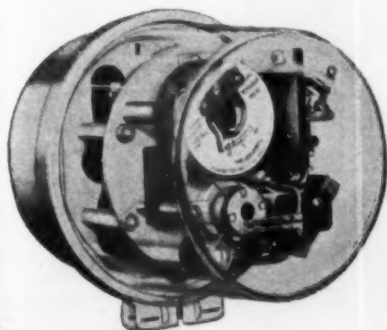
An inexpensive ignitron spot welding timer with simplified circuits and construction. Timer will mount two sizes of ignitron tubes. Provides high accuracy of control, adjustable to pass current for any number of cycles from 1 to 15. Current starts and stops at current zero eliminating line current transients. Westinghouse Electric & Mfg. Co. East Pittsburgh, Pa.



WESTINGHOUSE IGNITRON TIMER

## Relay

The Microtrol relay, housed in weather-proof case, provides an automatic, ultra-sensitive controller, entirely self-contained. The input relay will operate on values from 2 microamperes up and from 0.5 millivolt up. Power relay contacts will handle 5 amperes at 110 volts a.c. non-inductive. It is used in various circuit functions such as control of automatic doors, smoke alarm or liquid density control, a.c. and d.c. voltage or current alarms and over- or under-temperature or thermocouple failure. The Microtrol relay, combining the Sensitrol relay model 705 and the power relay model 712, is designed for an operating interval in which the power relay will open and close once each four seconds. For use on 120-volt, 60-cycle circuits. For special requirements, relay can be supplied for any commercial frequency, at voltage ranges from 12 to 250 volts. Weston Electrical Instrument Corp., Newark, N. J.



WESTON MICROTROL RELAY

# A BETTER LOOKING JOB...

# Plus-

A BIGGER PROFIT MARGIN  
FOR CONTRACTORS with the

## CLEVELAND CONDUIT HANGER!



There's nothing like being able to offer a prospect something *better* than he can get elsewhere in order to help close new contracts, and it's something *else* again to give him this better job and *still* make more money for yourself. But that's exactly what does happen when you use the new *Cleveland Conduit Hanger* . . . the customer gets a neater, more flexible wiring job when it is finished, and you save a substantial amount of time and trouble during the installation.

The **CLEVELAND CONDUIT HANGER** has many unique features that you'll welcome on every wiring job. Fewer units to handle; enables you to pre-assemble conduit for better alignment and hang parallel groups on one line . . . vertically, horizontally, or diagonally.

Study these views . . . see how much *neater* they look; how much more *rigidly* the conduit hangs; how much *easier* it must have been to make the installation with rails and clamps all set up, ready to receive the conduit with but one screw to tighten on each clamp. Accommodating various sizes of conduit on a single rail, and permitting suspension or fastening direct to beams, you've got the most flexible layout you could ask for.

Cleveland conduit hanging equipment gives you everything you need . . . channels, rails and clamps . . . and there are *no extras!* Sounds good? Let us send you all the details!

## Write Today...

for full information on this innovation in conduit hanging . . . and its economical, efficient use in making your work more profitable!



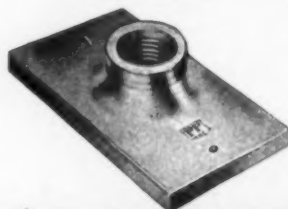
## THE CLEVELAND SWITCHBOARD CO.

2927 EAST 79th STREET

CLEVELAND, OHIO



# N.B. - PORCELETS MEAN NEW BUSINESS!



## ...AND SHOW CONTRACTORS MORE PROFIT ON EACH JOB

Ordinarily, the letters "N.B." mean merely "Reader Take Notice", but when applied to Porcelets (all-porcelain outlets) they mean "New Business for Contractors!" And more profitable business, too, because Porcelets not only offer users distinct advantages in service, but decided savings in installation. They're shock-proof, short-proof, and fool-proof, so they're particularly suited for use under hazardous conditions . . . in addition, they need never be grounded, require no clamps or connectors, and the same box does for all outlets, so they save time on the job and simplify installation. Let us send you illustrated data showing breadth of application . . . or ask your electrical jobber for details.

## PORCELAIN PRODUCTS, INC.

FINDLAY



OHIO

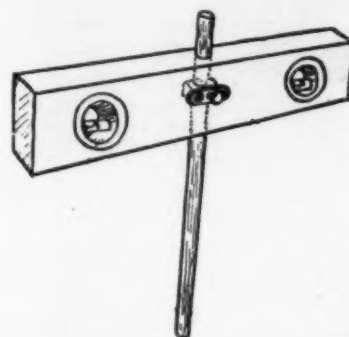


EQUIPMENT *News*

[FROM PAGE 81]

## Switch Box Setter

A method of installing switch box by use of an "Electrician's Guide" and a set of "Clipper" supports. A mark is placed on the stud through the use of a guide which consists of a horizontal bar with two spirit levels and an adjustable rod at right angles to establish the height. Clippers nailed on the inside of the stud at the mark accurately line up wooden cross pieces which are toe-nailed into the stud. The switchbox attached to the cross pieces is accurately in position at a uniform distance from the floor. Michael J. Gallagher, Kingston, N. Y.



GALLAGHER SWITCH BOX SETTER

## • CAPACITORS •



## For Any MOTOR

It's easy and profitable to service electric refrigerator motors with AEROVOX capacitors. Handy listing indicates exact replacement needed. Local refrigerator parts jobber has it in stock. So just install it . . . forget it . . . collect for it. No headaches.

### Ask for DATA . . .

Local refrigerator parts jobber has latest AEROVOX replacements listing. Ask for your copy. Or write us direct.



## PROOF



Here's proof you can depend on ILSCO Solderless Lugs to grip wires securely — against as much as 480 LBS. PULL!

Capacity of scale used in test: 500 lbs. Lugs used same size as shown below, for #8 to #4 wire range.

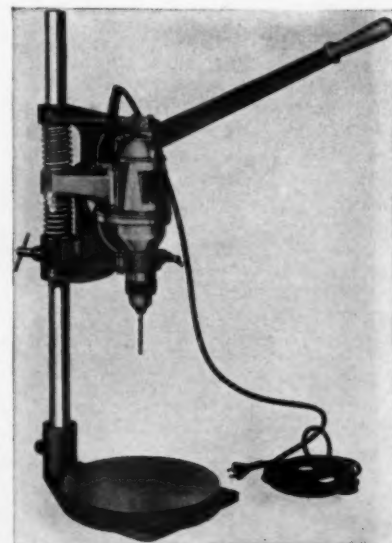
Write Dept. EC for samples.



ILSCO COPPER TUBE & PRODUCTS, INC.  
5629 Madison Road, Cincinnati, Ohio

## Bench Stand

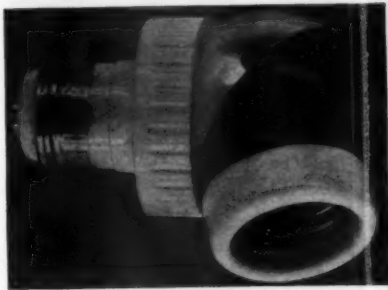
A bench stand—DS-5 that can be converted easily and quickly into a stationary drill press for use with the Signal OB-5 1/2-inch drill. For production or on occasional jobs, its use increases the work range of Signal's OB-5 drill. It reaches 32 1/2-in. high above its base which is 11-inch. in diameter, with a 1 1/2-in. diameter column. Signal Electric Mfg. Co., Menominee, Mich.



SIGNAL BENCH DRILL STAND

### Angle Adapter

A new adjustable angle adapter for use with the new mazda projector and reflector lamps. Can be inserted in any existing outlet and enables lamps to be adjusted over a wide range of angles, either for flood or spot lighting. Vertically adapter permits adjustments of as much as 70 degrees. Horizontally it can be swung around 340 degrees, directing light where it is wanted. General Electric Co., Bridgeport, Conn.



G.E. ANGLE ADAPTER

### Lighting Fixture

This semi-indirect fixture is designed for maximum non-glare light. Glass bottom has ring-like louvres to obtain light on display or working surface, body and sides are light opal enamel finish for light diffusion in all directions. Reflector is removable, sets on the glass, converting it into a semi-indirect fixture and gives even light diffusion to top and sides. For use in stores, offices and showrooms. Style No. 616 uses 75 to 150-watt lamps and No. 1019, 100 to 300 watt. Naturlite Corp., 122 Fifth Ave., New York.



NATURLITE LIGHTING FIXTURE

### Self-Diffusing Lamp

Wabash Superlite, a new type of glare-free electric light bulb, designed to act as its own diffuser. Claimed to change ordinary harsh filament light into restful illumination, without losing any light, and with complete elimination of glare. Treatment on inside of the glass breaks up the filament rays into "counter-diffusing" light rays, to give white illumination without the need for extra diffusing equipment or extra current. Diffusion is over the entire bulb surface without light loss. Made for home, office and factory lighting. Sizes from 15 watts to 300 watts. Wabash Appliance Corporation, Brooklyn, N. Y.

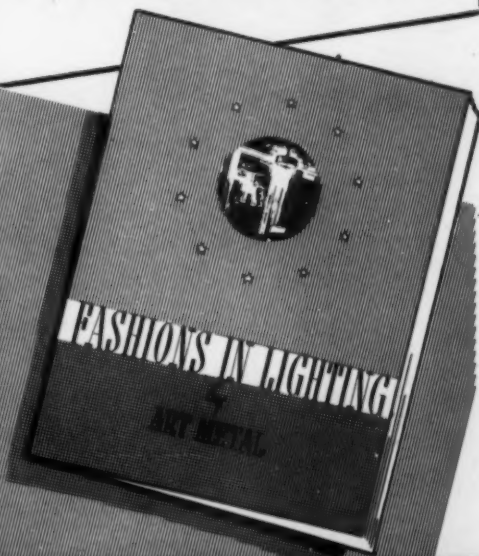
## Lights of Living Loveliness FOR PROFITABLE INSTALLATIONS



### THE ART METAL COMPANY

1814 EAST 40th ST.  
CLEVELAND, OHIO

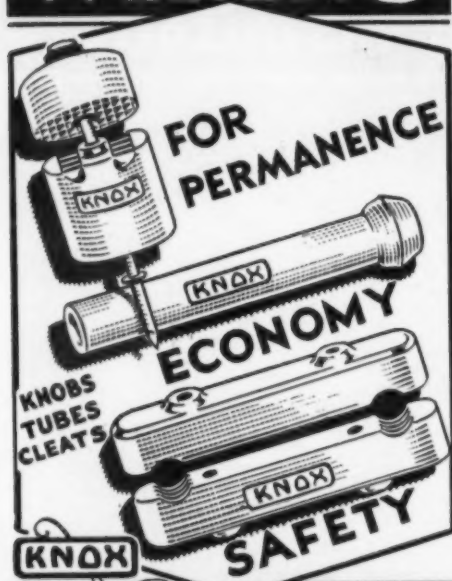
• This Beautiful and  
Informative Booklet  
Will Prove Invaluable  
in Helping You Sell  
Better, More Complete  
Home Wiring Jobs...



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## KNOB & TUBE WIRING



*A symbol of satisfaction*

.... SOLD THROUGH ....  
ELECTRICAL WHOLESALERS

KNOX PORCELAIN CORP.  
KNOXVILLE, TENNESSEE, U.S.A.

## BURNDY LUGS



## EQUIPMENT *News*

[FROM PAGE 83]

### Lighting Fixture

This new Permaflexor luminaire B-53 is designed to provide well-diffused, totally-indirect illumination. Canopy, stem and bowl are made of steel. Aluminum is used for husk. Contains a silver glass reflector which controls and distributes light. Bowl serves as an ornamental enclosure. Recommended for school rooms. Pittsburgh Reflector Co., Pittsburgh, Pa.

PITTSBURGH

PERMAFLECTOR

LUMINAIRE



### Hand Lamp

Big beam is a super-power, rechargeable portable storage battery hand lamp. Casts a light over one-half mile distant and will burn 10 continuous hours. An auxiliary bulb operated by an independent switch will burn 60 continuous hours. Features are a specially designed rubber reservoir which seals in battery vents, collects fumes and prevents spillage, eliminating corrosion of terminals and protects clothing of person carrying the lamp; and simplicity of recharging battery through lamp head without removing battery from its case. A dash board type switch can also be furnished whereby lamp battery can be charged direct from the charging system of an automobile, truck, or motor boat. U-C-Lite Mfg. Co. 500 North Dearborn Street, Chicago, Ill.



U-C-LITE MFG. BIG BEAM

## RE-MO-LITE

**SAVES** WIRE ON LABOR MATERIAL

For

RURAL ELECTRIFICATION  
AND INDUSTRIAL LIGHTING



A new developed and perfected lighting unit that gives convenience, comfort, and safety—the only remote-controlled lighting unit on the market. With RE-MO-LITE, the lighting circuit is controlled from a one-wire service over your 110-volt service, instead of the old 3-way system. The control is adaptable for any standard yard-light and comes complete with two switches, lag bolts, service screws, instructions—handles any number of switches on same service, which means any number of switches for your yardlight at any point. Make your rural and industrial lighting jobs more profitable with RE-MO-LITE, and at the same time give your customers the best in lighting efficiency. It will pay you to get details on our free trial offer—Write Today!

*Twentieth*  
CENTURY ENGINEERING CO.  
MANKATO, MINNESOTA

### MINERALLAC HANGER



Conduit  $\frac{3}{8}$ "— $2\frac{1}{2}$ "  
Cable to  $2\frac{1}{8}$ " (with Bushings)

### MINERALLAC JIFFY CLIP



Sizes from .250" O.D. Tubing  
to  $1\frac{1}{4}$ " conduit.

See your Jobber

New York City Office  
Theodore B. Dally  
50 Church Street

**MINERALLAC ELECTRIC CO.**  
25 N. Peoria St., CHICAGO



## Wall Pocket Lantern

A new wall pocket lantern made in white metal alloy. Can be furnished in black or mottled green finish or polished. It is 12 $\frac{1}{2}$ -in. overall and has a 4-in. x 9 $\frac{3}{4}$ -in. half cylinder of opal glass. The Herwig Company, 1756 Sedgewick St., Chicago, Ill.



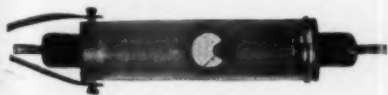
HERWIG LANTERN

## Conduit Fittings

New standard conduit fittings—rectangular Pylets, FS and FD, vaportight lighting fixtures—have been added to this line of heavy duty railway and industrial electrical equipment. Includes all standard types of threaded conduit fittings. Large wiring space is provided and rounded edges of cover opening prevent chafing of wires. Top surfaces are ground for seating of covers and cover screw holes are counter-bored for self-alignment of covers. FS and FD series have square corners to take standard switch and receptacle plates. Pyle-National Co., 1334 North Kostner Ave., Chicago, Ill.

## Voltmeter

A new portable high-resistance voltmeter has been developed for use in phasing out power-distribution circuits. Unit consists of an instrument connected in series with a small neon lamp and two high-voltage resistors that are treated to assure stability together with immunity to the effects of varying atmospheric conditions. Transparent plastics tube, etched outside except for a window, houses the component parts, which are mounted on a strip of special high-dielectric-strength and leakage-resistant insulating material. In phasing out 5,000-volt circuits, the instrument will show approximately zero if correct phase relationship is obtained or will go off-scale, indicating an improper connection. General Electric Co., Schenectady, N. Y.



G. E. VOLTMETER

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## No. 284 Duplex Receptacle Nozzle

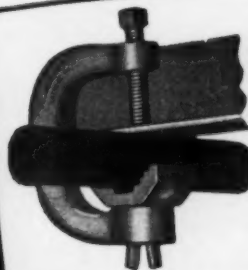
With 1/2" brass pipe extension. Neatest and most compact fitting obtainable. Also available with 3/4" pipe extension. Fullman also offers Duplex Telephone Nozzles.



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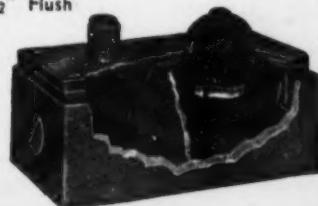
## "Bull Dog" Pipe or Conduit Hanger

Pipe support can be turned freely, permitting pipe to run parallel, or at right angles to beam. Eliminates drilling or use of straps. Will accommodate sizes of 1/2", 3/4" and 1" pipe to steel beams 3/8" thick.



## No. 252-R Two Gang Box

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- properly record data when stripping armatures so that it will be instantly usable for correct rewinding by yourself or any experienced winder at any time afterward
- determine how many coils can safely be cut out
- lay out single-phase fan motor windings
- change single-phase windings for two- or three-phase operation
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- lay out frog-leg windings
- handle every step in a rewinding job from the time it comes into the shop until it leaves
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- band high-speed armatures
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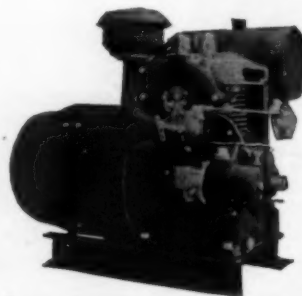
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## EQUIPMENT News

[FROM PAGE 85]

### Two Cylinder Katolight

This new two cylinder, aircooled, 2,000 watt a.c. Katolight, generates standard 110-volt, 60-cycle, a.c. Self excited and can be furnished with remote control or full automatic control or may be started manually. Engine has sensitive governor giving close voltage regulation. Also high tension magnet, with shielded spark plugs and wires. Generator is filtered. The d.c. winding has been designed to keep commutator ripple to an unusually low point. Engine is furnished with either 2½ gallon gravity tank or fuel pump. It is 28-in. long, 18-in. wide and 23-in. high. Weighs 327 pounds. Kato Engineering Co., Mankato, Minn.



KATO ENGINEERING KATOLIGHT

### Light Meter

A new photo-electric light meter for studio, darkroom, laboratory and test-room. Used for measuring illumination, brightness, density, light transmission and reflection; for testing automobile headlights, motion picture screens; for determining exposure in photography at low light levels, color - photography, micro - photography, photo - enlarging and photo - engraving. An ultra sensitive precision instrument with one photocell and galvanometer. Distinguishes light values down to 1/100 foot candle. Rugged and shock proof. Housed in carrying case, with cable to photo element which may be held in hand. Multiple photo-cell available. Intercontinental Marketing Corp., 8 West 40th Street, New York.



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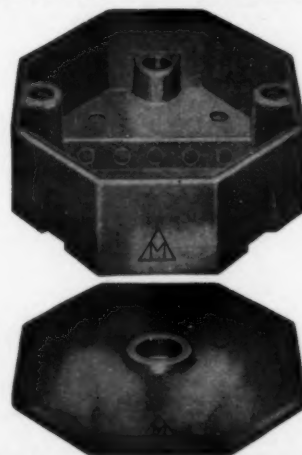
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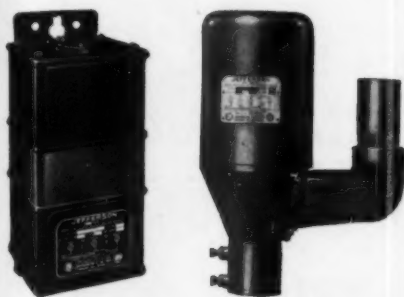
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## Mercury Lamp Transformers

Two new types of weatherproof transformers for use with high intensity mercury lamps. Assembled in heavy one-piece drawn copper-bearing, weather-resistant steel cases filled with high dielectric, water-proof compound. Illustrations show pole type transformer with lamp fixture mounting support and standard indoor type. All connections in pole type transformers may be made at mast head adjacent to mercury lamp, making transformers adaptable to old installations. Jefferson Electric Company, Bellwood, Illinois.



JEFFERSON TRANSFORMERS

## Mercury Lamp

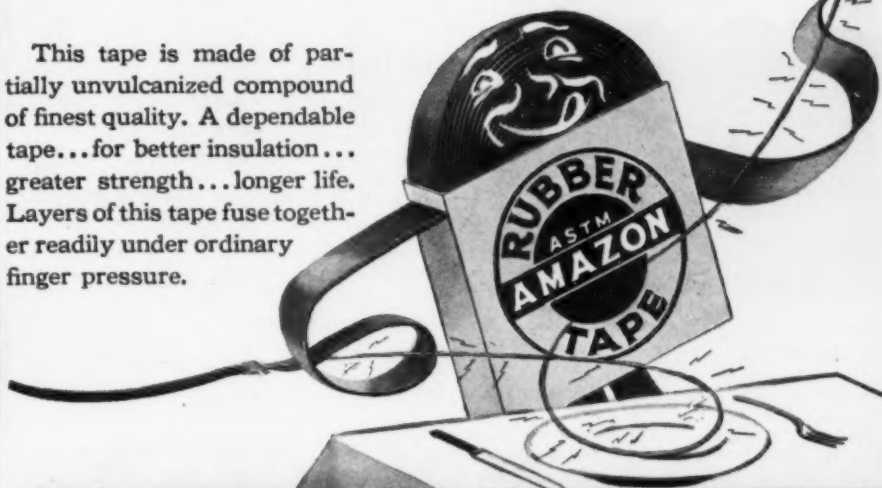
A 100-watt bulb constructed of filter glass for fluorescent effects. Glass of lamp bulb selectively absorbs undesired radiations, visible and invisible, while transmitting the near ultra-violet which is effective for fluorescence excitation. Radiation range of lamp is from 3,000 to 4,000 anstroms. Has a rated average laboratory life of 1,000 hours. Radiation from red purple bulb should be controlled by use of a suitable reflector. Aluminum reflectors concentrate the ultra-violet output of lamp within small area at high intensity or over a larger area at reduced intensity. Lamp operates only in conjunction with reactive ballasting transformers. General Electric Vapor Lamp Co., Hoboken, N. J.



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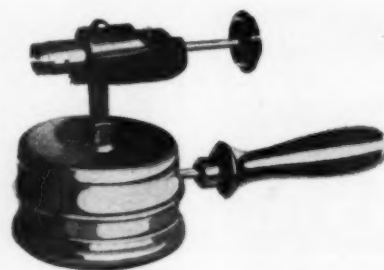
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[FROM PAGE 87]

### Blow Torch

A new line of pumpless safety blow torches. No. 200 is designed for large tool performance. It delivers a large, clean hot and steady flame at a temperature of 2400 F or a small pointed blue flame, as desired. When adjusted to suit operator, the desired flame length will maintain until fuel is consumed. Gasoline capacity is one pint. No. 300 is recommended for desk and bench use indoors. Fuel capacity is six ounces, representing a burning time of four hours. The small No. 100 model has a fuel capacity of two fluid ounces and a burning time of one hour. Baumgarth Mfg. Co., 836 Hubbard St., Chicago, Ill.



BAUMGARTH BLOW TORCH

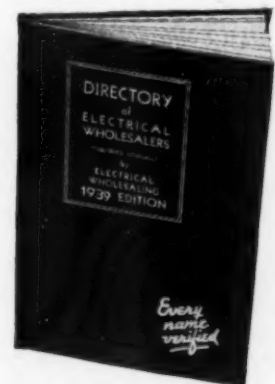
### Pipe Threaders

The new "Rigid" No. 65R and 85R pipe threaders are made of all-steel and malleable alloy construction, with drop-forged hardened steel cam plates. This series threads 4 sizes of pipe, 1 in., 1½ in., 2 in. and 2½ in., all with one set of chaser dies. Only 4 dies stay in the threader, saving time and trouble for operator. A choice of cam type and plate type. Both types are set to pipe size and tightened with one screw. Workholders take 2-in. couplings for threading 2-in. close nipples. Ridge Tool Company, Elyria, Ohio.



RIDGE TOOL PIPE THREADERS

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## Clamp-Ammeter

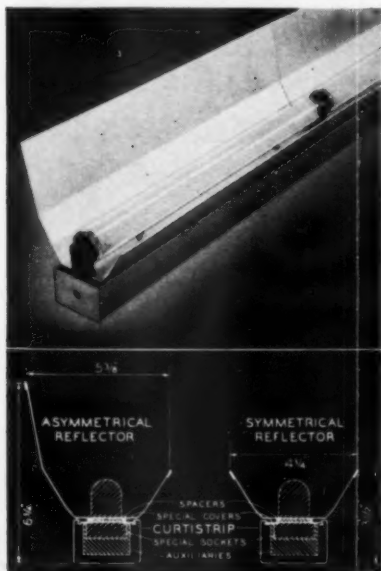
This new bakelite encased a.c. clamp-ammeter combines six ranges in one instrument and will measure current flow through conductors (insulated or non-insulated) up to 21-inches in diameter. Equipped to measure low as well as high values. Ranges are 10, 25, 50, 100, 250 and 500 amperes. Designed to be used at all commercial frequencies. Weston Electrical Instrument Corp., Newark, N. J.



WESTON CLAMP-AMMETER

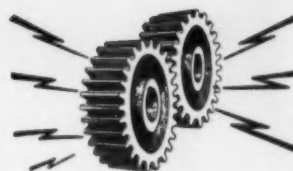
## Fluorescent Lamp Equipment

New equipment for use in a wide variety of fluorescent lamp installations, such as exposed or concealed, single lamp assemblies, continuous linear assemblies, suspended or surface mounted installations, cover, recessed or trough lighting. It uses the Curtistrip wiring channel, 2 1/2 in. by 1 1/2 in. as the basis of all fluorescent assemblies. Snap-in covers for surface mounting installations. Reflectors available either in symmetric or asymmetric shape. Mounting brackets, straps and other supporting fittings are offered to facilitate installations. Curtis Lighting, Inc., 1123 West Jackson Blvd., Chicago, Ill.



CURTIS FLUORESCENT LIGHTING EQUIPMENT

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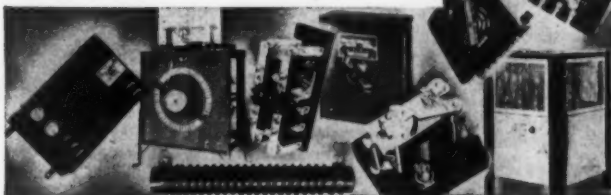
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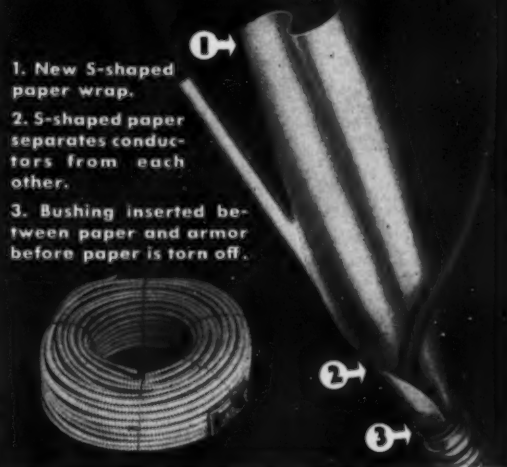
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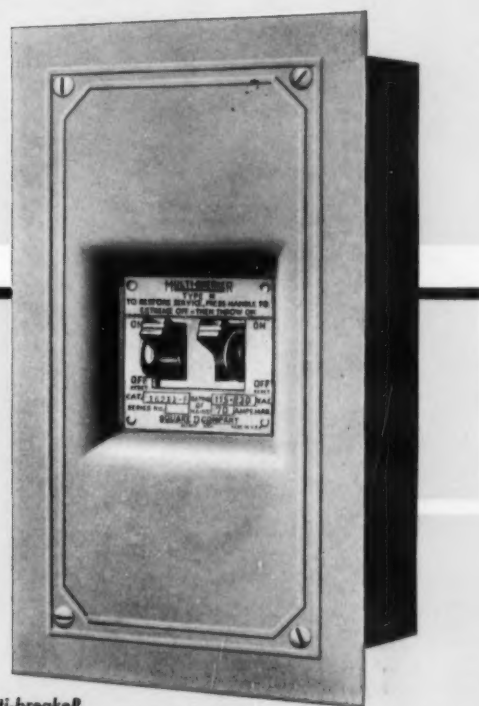
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